Calvinism and the Philosophy of Nature

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Calvinism and the Philosophy of Nature

The Stone Lectures
Delivered at Princeton
in 1930

by

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To all

TRUE CALVINISTS IN AMERICA

PREFACE

The subject which I chose for my Stone Lectures at Princeton is, I think, of great importance for the believing science of today. If Calvinism is to preserve its purity, and at the same time fulfil its calling, it must come to more intensive reflection about the things concerning which these lectures speak. This matter cannot suffer delay. Here it is a case of periculum in mora.

It was not possible for me, due to the number and length of the lectures, to treat the subject matter as extensively as I had wished. I trust that God will give me opportunity to complete this work later on, and that what I have accomplished up to this time may incite others to continued work.

My hearty thanks are due the L. P. Stone Lecture committee for their invitation to give the lectures, which invitation I appreciated very highly; to Dr. Winfield Burg-

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V. Hepp

May 9, 1930.

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Calvinism and the Philosophy of Nature

Chapter I

CALVINISM AND THE PHILOSOPHY OF NATURE

The time in which we live is bent back to the first centuries of the Christian era. If you believed in a historic cycle, you would ask whether we are not entering anew the era of nearly twenty centuries ago. They who swear by the idea of an uninterrupted progress are hard pressed now. The Christianity that really perseveres in the doctrine of the apostles, and that seeks its comfort in the truth that the blood of Jesus Christ God's Son cleanses from all sin, finds over against itself a mighty heathendom that sometimes displays its evil courage in adorning itself with the name of Christian. The characteristic phenomena of the period in which early Christianity began its career through the history of mankind, namely,

moral decay, passion for luxury and pleasure, enthusiasm for Oriental religions, syncretism and scepticism,—these are the factors which have produced our modern types of religion, morality and culture. Due to the wonders of technical science, the modern man enjoys a luxury compared to which the luxury of Hellas and Rome appears primitive. Sins which are more against nature than those of which St. Paul said that they were not found even among the heathen, and which, when they appeared, were despised as an abomination, are now openly clamoring for the seal of legitimacy. Spiritual voyages of discovery, which look very much like pilgrimages, are made from the West to the East to import Buddhism, Hinduism, Soefism and other doctrines. Theosophy and anthroposophy decoy the unbalanced man of culture into their holy places. Krishnamurti, Annie Besant's chosen one, is introduced as the World-teacher

with real twentieth century advertising. The syncretism of today is a real competitor of the syncretism of long ago. Efforts at unity have become the vogue. Efforts are made not only to unite various groups within the Christian faith, but also to unite all those who have but the slightest respect for religion in general. Some are even thinking of fusing religion and philosophy, so that, just as before, religion must surrender her place of honor to the philosophy of religion. It seems as if a new golden age is coming for scepticism. Scepticism presents itself in a variety of forms. The parlor-scepticism of Pilate is not missing today. Religious scepticism is throwing many into pessimism. And especially scientific skepticism utters such piercing and bitter cries. Her representatives tell us again and again that present day science has become chaos. And those who have still retained a small spark of optimism, express their approval.

So *Eucken* said: "We are tossed about uncertainly hither and thither on the waves of time, helpless even against our own whims and passions, at the mercy of winds and waves." And he adds the question which is not merely rhetorical: "May we still hope?" *Hugo Dingler* passes this judgment upon our time: "The pillars of culture, in so far as they rest upon knowing, are broken in two. We stand before the ruins." *Karl Heim* feels that when *Einstein's* theory of relativity enters into its second stage, it will end in a subjectifying of all science. He does venture to prophesy that the sense of dependence upon God will remain as the only absolute; but the illusion that he will be accredited as a prophet at the court of Her Majesty Science, must be taken from him. And the well-known *Von Uexkull* uttered this annihilating statement: "A scientific truth is a mistake of today." Quite naturally, there are always many stu-

dents of science who pay no attention to this shifting that is going on about them. They hold fast to the old theories, fearing lest they lose all support. They ride the hobby-horse that has served them and others for half a century or more with pathetic loyalty, and are deaf to all warnings that this hobby-horse is breaking down. They are more tipsy even than the feasting friends of Belshazzar. The city is being undermined, but they raise their glasses, filled with their favorite wine, and make their toasts. An invisible hand writes on the wall: Mene, mene, tekel, Upharsin, but they do not see it.

The crisis in which all of science finds itself, began with natural science and the philosophy of nature. When a 'crash' comes in Wall street, it is felt in the whole world. It is so here. The philosophy of nature, of which such high expectations were cherished, has pulled other sciences down with

her in the debacle. It is of great importance to know the answer to this question: Is Christian science ready to restore the disturbed balance, ready to put solid ground under the feet of the doubting throng and a roof above their heads, ready to say: Here you have a science, here you have a philosophy of nature that have lived through every shock? I wish I could answer this affirmatively. To be sure, Apologetics has tried to defend the truths of Christianity against the attacks of unbelieving science. We salute the men who were in the van-guard. But when we make up the balance sheet, it must be admitted that the results of Apologetics are not commensurate with the labor bestowed. How often has it not sent premature tidings about 'finds' which were said to justify the Christian faith. How much has it not surrendered — what it should not have surrended — to unbelieving science, with the

hope that the offense of Christianity would be taken away from the philosopher of nature and other philosophers. So that now when the unbelieving philosophy of nature is lying in death's agony, Christian Apologetics must be the last to receive thanks for this. Our making sport of the millions of years with which geologists, biologists and astronomists gambled, may certainly not be looked upon as a smooth stone from the brook wherewith we as another David slew the Goliath of the philosophy of nature. There is also another kind of Apologetics which is now living through joyous days. It busies itself with registering what unbelieving systems have been replaced by others. The history of the non-Christian philosophy of nature is looked upon—and taken by itself this is perfectly correct—as the history of its decay. This Apologetics enjoyed a dream like that of Pharao. It saw how the lean kine of systems did eat up

—not the fat—but other equally lean kine, and how the last of these kine have nearly become fossils, fit only for a museum of natural history. But malicious joy is other than the compassion of Christ. Our enemy hungers for a philosophy, but we cannot give him to eat. He thirsts especially for a philosophy of nature, and we cannot give him to drink. I repeat: I do not wish to under-estimate the good services which Apologetics have done. Even though it has not made an impression, outwardly, such as was desired, yet it has worked guardingly within. Nor am I forgetting that the Christian man of science cannot live on the philosophy of nature alone. True Christianity has remained intact up to this very day. It still preaches the Christ of the Scriptures in Whom all treasures of wisdom and knowledge are stored. The moment the sceptic believes in Him, he has eternal life. It is far better to be saved without a philos-

ophy of nature than to be lost with a philosophy of nature. But all this does not do away with the fact that Christianity must be accused of debts that are overdue. It has girded the sword against the unbelieving philosophy of nature, but it forgot to build up a believing philosophy of nature. Sixteen years ago I wrote that an *independent* Christian philosophy was still lacking; and since that time there has been no improvement at this point. But Christian thinkers have contributed much material which can be used in building a structure of Christian philosophy. This cannot be said for a Christian philosophy of nature. Here nearly everything must still be contributed.

Do not think for a moment that my aim here is to deliver an invective against Christendom. I merely want to raise my voice against the assertion which is being made here and there, that Christianity has been of unusual service to the philosophy of na-

ture. Honesty demands that we contradict this, even though the contradiction may not flatter us. I wish to prove this from history, and at the same time use that history to plead extenuating circumstances.

When Christ sent His apostles out into the world, He gave them the Gospel, and not a philosophy of nature. The Gospel was the most necessary. Through the Gospel, with the co-operation of the Holy Spirit, the heart of peoples must be renewed, and their thoughts centered upon the one and true God and Jesus Christ Whom He has sent. But this Gospel had leavening power. It must work its way from the center to the circumference. It was intended to leaven all of life, also science. But that could not all happen at once. It required a process. It need not surprise us, therefore, that the early Christians were not equal to the heathen, scientifically. And yet, the Apologetic Fathers felt themselves called to a scientific

defense of the Christian faith. But, alas, they made a wrong move. Instead of satisfying themselves with a somewhat primitive philosophy, which at least had been gotten out of pure Christian principles, they laid hold on large parts, and sometimes sadly misunderstood parts of the hostile philosophy. They even dragged this into theology. We must agree with *Dilthey* that from the very beginning theology has been interwoven with antique science. The philosophy of nature stood in the background. To be sure, they did maintain with great conviction, not only over against the heathen, but also against the gnosis: credo in deum patrem omnipotentem creatorem coeli et terrae. And they did combat the atomic theory and the materialism of *Democritus* and the *Epicureans,* as being irreconcilable with monotheism. But having done that, they did no more. *Tertullian* thought that investigations in nature were entirely un-

necessary. Even *Augustine* did not think differently. Admitting that Christianity is greatly indebted to this prince of thinkers, and that his value for theology, metaphysics, epistemology and psychology is very great, yet, the development of a philosophy of nature was hindered rather than helped by him. To the end of his life he was not able to conquer neo-platonism within himself. His life-motto: "Deum et animan scire cupio. Nihilne plus? Nihil omnino." attracts because of its real piety, but it also raises doubts because of the neo-platonic sound. He does not desire to know God and the *world,* but God and the *soul.* Only the spiritual counted for him, while the physical was for him something of less worth. And so he sought the personality of man only in the soul, while he appreciated the body merely as a necessary instrument. The physical world has value only insofar as it teaches us to behold the attributes of God;

for the rest we can miss it, since it makes no contribution to the salvation of man. With the pretense of clinging to Scripture the Christian sometimes says things about heaven and earth which cause the non-Christian to withhold his laughter only under great restraint. How, asks *Augustine,* shall the unbelievers put their faith in that same Scripture when it speaks of the resurrection of the dead, the hope of eternal life, and the kingdom of heaven? At the same time, he cannot refrain entirely from making some observations in the field of natural science. He teaches that the act of creation was completed in one moment of time, that the hexaemeron is nothing else than an interpretation of an idea which can be understood by human reason only when stated thus, that organic seeds — rationes seminales—were deposited in creation, that the sun is larger than the earth, that there are no such things as the antipodes, since

the Gospel had been preached over the entire world, and no such beings had been seen. But you will agree with me that such data, which could be increased, can never serve as a foundation for philosophy of nature. And even his story about the rhetorician Fundanius who lost an eye in an accident, and thereafter begat a son with one eye, from which he draws the conclusion that natural characteristics can be changed by something quite accidental, will be too much of a story for even the most stiff-necked believers in the theory of the heredity of acquired characteristics. What decides the matter here is the life-attitude of *Augustine.* As far as the philosophy of nature was concerned, he shunned it. And Christendom persevered in that attitude for many centuries.

It must not be forgotten that the state of affairs became continually less favorable for scientific research and reflection. The fall

of the Roman empire, the coming in of the Teutons and the Arabians into the center of culture about the Mediterranean sea, the invasion of the Vandals, the destruction brought about by the Goths, the plundering of the Huns, the great migrations of the peoples, the slaughtering epidemics,—all these took away the necessary quiet and prosperity which are indispensable for the cultivation of science. It seemed as if a period of rest was to be ushered in at the time of Charlemagne. But that was short. Political quarrels and the mutual penetration process of the German and the Roman spirit awakened new unrest. The monasteries are to be thanked for preserving the scientific labor of previous generations from total destruction. There is every excuse for the stand-still to which the research and the making of a philosophy of nature had come.

When more orderly circumstances had been created, the need for a philosophy of

nature arose with the need for other sciences. But, what a calamity! The history of the Apologetic fathers was repeated. The easiest way was again chosen. Efforts were not made to build up, in the sweat of one's brow, a Christian philosophy and a Christian philosophy of nature, constructed from Christian principles and by independent research. They began to borrow again from heathendom. Not from *Plato* this time, at least not for the philosophy of nature, but from *Aristotle.* The Arabians, although deficient in their knowledge of *Aristotle,* offered a system of nature all ready-made. Christianity opposed it. And even when the ideas of the Stagerite were drawn from purer sources, they were not accepted. In 1210 the Council of Paris decreed that "no books of Aristotle about the philosophy of nature, nor commentaries, may be taught in Paris, neither in public nor in secret, and we forbid it under sen-

tence of proscription." But it was too late. *Aristotle* had already biologized the spirits. *Pope Gregory IX* saw this, and to turn the tide, lest the theories of the pagan philosopher should be accepted unchanged, he ordered a revision of Aristotle's philosophy of nature in harmony with the doctrine of the church. For the time being that task was too great. It was the genius of *Thomas Aquinas* which fused these two heterogeneous ingredients: heathen philosophy of nature and Christian principles. He seems to have succeeded remarkably well. He did suffer bitter opposition during his life-time, an opposition which went right on after his death, finding an energetic pace-maker in his successor *Peckham.* But his system gained the victory in the end. Both the Averoistic Aristotelianism and the neoplatonic Augustinianism succumbed before it. That this system must of necessity be amphibious, they did not see. Just recent-

ly one of the best students of Thomas wrote: "Thomas did not lose himself in Aristotle, but rather Aristotle in Thomas." Perhaps so. But then not like a crocodile gobbles up a man, to make him part of his own flesh and blood, but like the fish which swallowed Jona. *Aristotle* lived on undigested in the belly of *Thomas,* and *Thomas* did not have the strength to cast him out upon the dry land. Even in his theology we can find traces of Aristotelian Deism. Especially in his philosophy he is naturalistic through and through. He tried to justify this by adopting a dual source of knowledge. As the first one he takes the natural light of reason. This equips one to think through to the essence of things, yes, even to their first cause and last purpose. Positive sciences can be built up by it. As second source of knowledge he mentions divine revelation, which leads to the knowledge of God. Although the sciences of the

faith and the sciences of nature can support one another, yet they each have their own domain and are autonomous there. Rationalism and revelationalism walked arm in arm up the mountain of the future. The men of the natural sciences, who had chosen *Aristotle* as their guide, and the theologians, celebrated a long feast of brotherhood. Added to this, *Thomas,* who did not do any research work in nature, credited *Aristotle,* who was both student and philosopher of nature, but whose results in one field did not at all agree with the theories set up in the other, with absolute authority. He applied the deductive method to all of Aristotle's statements about nature, whether reached inductively or deductively. There was no room for doubt in the human authority of this one person. The stimulus to know nature out of one's own scientific observations, was stunted. Everyone was happy in a certain and inclusive knowledge.

To say that the Reformation brought about a sudden change in this matter, would be an exaggeration. Various factors which had nothing to do with one another worked together to bring about the change. Firstly, by means of a thorough study of antiquity such men as Cardinal *Nicholas of Cusa* and *Copernicus* discovered other leaders than *Aristotle*. *Copernicus* came to his hypothesis of the helio-centric world-system not through his own observations, but because he trusted *Aristarchus* and others more than *Aristotle*. Secondly, alongside of this must be placed the lively reaction against the exclusive use of the deductive method. In the thirteenth century *Roger Bacon* advocated and defended the high value of empirical knowledge, while later on *Francis Bacon* propagated the idea that the inductive method was the only correct method for the natural sciences. But this did not lead to a complete break with the Thomistic

Aristotelianism. *Francis Bacon* was an opponent of the Copernican theory until his death. Thirdly, the urge to go directly to nature and to spy out her secrets with one's own eyes and not with philosophically colored glasses, became more and more evident. At the head of this procession there was the many sided genius of *Leonardo da Vinci.* Fourthly, the maritime journeys of *Vasco da Gama, Magellan,* and—for we must not forget him—*Columbus,* who discovered a new world because of a wrongly exegeted text from one of the Apocryphal books, which proved the untenability of the Ptolemaic view of the world, which was based upon Aristotelian theories.

Now, the Reformation ran parallel to all this. It did not cast aside human authority, but subjected it to the judgment of God's Word. It did not set *Aristotle* aside without due process. On the contrary, the Reformers leaned on him more than upon *Coper-*

nicus. With the same enthusiasm with which *Luther* thought he could lay *Zwingli* low by shouting at him in a not too friendly tone: "it is written: this *is* My body,"— with that same enthusiasm he said of *Copernicus:* "The fool wants to turn all of astronomy upside down. . . . But the Holy Scriptures say that Joshua commanded the sun to stand still and not the earth." For *Luther,* that ended the matter. He was not at all aware that at this point his exegesis of Scripture was inspired by *Aristotle.* And *Calvin,* although he gave expression to his views less crudely than *Luther,* was also under the impression that the earth stood immovable as the center of the universe. Reformed theology followed him in this for a long time. *Voetius,* the greatest of Dutch dogmaticians places the followers of *Copernicus* in the category of the sectarians. It must not be forgotten, however, in a fair criticism, that *Copernicus, Giordano Bruno,*

Galileo and others stood alone in those days, and that all of the natural sciences stood opposed to them. (as much so as the chur

The diagnosis of blindness to the facts of history would have to be made if it were not admitted that especially from the Calvinistic Reformation there issued forth a power which cleared the atmosphere in favor of a good development of the natural sciences. It certainly is not coincidence that the brightest stars in the heaven of the natural sciences rose just in those countries where Calvinism was dominant. We do not write our signatures in that black-bound book in which the Roman Catholic church is accused of having persecuted to the death honest students of nature. *Giordano Bruno* ended his life at the stake, not because he taught the immeasurableness of the universe, but because of his hostile-sarcastic attitude toward every positive religion, also toward Christianity, saying that religion

was an inferior kind of knowledge of God than philosophy. He was condemned as a heretic, and not as a student of nature. The gray-headed *Galileo* was not persecuted by the inquisition because he did homage to the Copernican system. Historical research of these later times has proved to the contrary that full freedom was given him to propagate his ideas, if he would only admit that they were *hypotheses,* and not eternal, unchangeable truths. He refused to do this for some time. The philosophy of nature has no right to write a book of martyrs, no, nor even a pamphlet of martyrs. At the same time, it cannot be denied that the Roman Catholic science, the theological as well as the non-theological, was too largely subject to the dictates of the Christian-tinted Aristotelianism; which had this result, that the study of nature did not have full freedom in Romish countries. In Germany too, because of the influence of *Melancthon,* the

Lutheran hierarchy could not be persuaded to break with the Aristotelian views. It was only in Calvinistic countries that the students of nature were not put into interne camps. It is the lasting honor of Calvinism that it has produced a *Newton*, a *Huyghens*, a *Boyle*, a *Swammerdam*;—a *Newton* whose achievements so bewildered the world that posterity carved this all but profane sounding praise upon his birth-place: "Nature and nature's law lay hid in night. God said: 'Let Newton be' and all was Light," and whose sense of his own insignificance was so great that he felt the need of magnifying the Majesty of the Living God;—a *Christian Huyghens* whose name is mentioned with reverence in all of Europe, and who left a position of honor in France when the persecution of the Huguenots threatened; he made the choice of a Moses and returned to his own fatherland;—a *Boyle* whose work in the natural sciences was of far greater

consequence than merely to lay the foundation for the newer chemistry, and who found his place in the circle of *Cromwell*, giving great sums of money for missions and for the translations of the Scriptures; — a *Swammerdam* who was so far ahead of his time in the domain of anatomy, histology, physiology and entomology that he was unappreciated by his contemporaries, although he bore it with Calvinistic patience and energy. The only shadow cast over his life was that in his later years he permitted himself to be towed along by the doting of Antoinette de Bourgignon. In a certain sense we may also add the name of *Kepler* who was hindered by Lutheranism because of his strong Calvinistic sympathies. The greatness of these men, all of whom were escorted by a close file of men of the second rank, does not need to be proved by me. It is unquestioned. The difficulty is to decide which among them is the greatest. They all

reached results which could not put up with Thomism or Aristotelianism. None of them cherished the definite purpose of combating Aristotle, but their research did point out that the chief theories of the Aristotelian-Thomistic philosophy of nature were founded on air. *Swammerdam* did not leave one stone of the pillar of the Aristotelian doctrine of "Urzeugung," upon which the then current views of organism rested, upon another, but erected as foundation of a new structure the doctrine of propagation.

But behold the tragedy of history! The thorough-going spirits of these men could find no rest until they had gotten some idea of the inner connection of the phenomena which they had discovered. They needed the support of a philosophy which had room in it for nature. The Aristotelian-Thomistic philosophy could not help them because of the very nature of the case, since the conclusions of their investigations clashed with it.

A philosophy which agreed with their Calvinistic view of life, did not exist! So they were driven by force of circumstance into the arms of the only other existing philosophy, the philosophy of *Descartes!* Not all of them were so directly under the influence of *Descartes* as was *Swammerdam. Boyle* forced himself to stay at a distance from the Cartesian system. But Copernicanism and Cartesianism had formed a league, and the majority of these eminent students of nature could not resist the penetration of it into their own thinking. Unnoticed, they became fascinated by it. How painfully Calvinism is aware even today of the fact that there was not then a Calvinistic philosophy of nature. Had there been such a philosophy, the course of history would have been different.

Unbelieving natural science today claims these men of Calvinistic faith as its own. They are honored as precursors of the Auf-

klarung, or the Enlightenment. In the name of truth I protest against that. The mark of the Aufklarung was that it divorced all authority, but these men continued to bow before the authority of the Word of God. But they did not find the necessary point of contact therein for every department of their research. Although they were always rather Calvinists in origin than precursors of the Aufklarung, it must be admitted with regret that they did not remain true to Calvinism in all its length and breadth. May this tempt us to make an accusation against the fathers of the Calvinistic Reformation? God, Who has determined everything, however unfathomable, with wisdom, keep us from doing that. They needed to concentrate all their attention upon the reformation of church and doctrine, upon the need of men's souls, and even more, upon the honor of the Mediator between God and man. But these sad facts have opened our eyes to the fact

that in regard to our science it is just as necessary to pray: "Our Father who art in Heaven, give us a believing philosophy of nature," as it is to pray for our physical needs: "Give us this day our daily bread."

The speculative philosophy of nature asserted itself in the Aufklarung. Headed by *Leibnitz* and *Wolff* it made surprising progress in *Kant*. It paid little or no attention to exact research. Empirical data were neglected for the most part. It set up a series of axioms out of which it deduced the phenomena of nature. In *Schelling* it became phantasy. The system of *Hegel* with its absolute negation of the results of the natural sciences provided for it the funeral of an ass. And the careful indecision of *Lotze* was not able to resurrect it. It was and remained dead. Meanwhile the investigation of nature went ceaselessly on. For a moment it seemed as if the French Revolution would smother it. When the worthy *Lavoi-*

sier, who among other things, had proved the incorrectness of the much loved phlogiston theory, was condemned to death, and a friend pleaded for his life on the basis of his scientific qualities, the proud answer was given: "We have no longer any need for learned men." The French Academy declared that the idea that meteors came down from other heavenly bodies, was a fable. They had scarcely declared this, when it rained meteorites in Normandy. This learned society had, of course, to swallow its declaration with wry faces. For the rest, favorable conditions assisted the research in nature. The detecting qualities of the men who gave their lives to this work, bordered on the impossible. The record of their labor reads like a detective story. Some of them displayed heroic courage which equalled that which grows out of love for country. More than one have been horribly crippled or even carried to their

graves, as sacrifices to science. Ariadne threads were found everywhere in the labyrinth of nature. Instruments were perfected to the extreme. Experiments boasted victory after victory. Both in the organic and the inorganic world complexes were discovered which formed a whole world-system in themselves. Out of this there grew a technical science which still changes the face of the earth daily and reaches even into our homes. The names of those who have won honors for themselves in the natural sciences during the 19th and 20th centuries would make such a long list that I shall not venture to read it here. The mention of some would be an injustice to the others. Co-operation was international, with the United States of America in the lead. Nevertheless, the more profound spirits were unhappy. Natural science seemed to them to be so much like a world exhibition, where phenomena and groups of phenomena were

displayed in colorful booths. But the inner connection between them, the origin and the purpose of it all remained hidden from them. They hesitated to accept the comfort of *Goethe's* words: "Ins Innere der Natur dringt kein erschaffner Geist."

The lack of a philosophy of nature brought renewed pain. Then the men of the natural sciences, or those who were guided by them, went to work to create such a philosophy themselves. Theories which were valid for only a small part of nature, were declared to be valid for all of nature, and even for the life of the spirit. *Buchner, Vogt, Moleschott, Czolbe, Spencer, Haeckel, Avenarius, Mach, Ziehen, Verworm, Wahle, Reinke, Oswald, Driesch,*—these are but a few of the countless number who presented not only a philosophy of nature, but a complete world-view. Philosophies are built like radios. But man can find no satisfaction in this, because he likes to meditate on

the being and working of nature. All these philosophers combat one another with great fury, and that makes a choice difficult. Besides, the foundations of the natural sciences are beginning to quake. Natural laws which have been accepted for centuries as being unchangeable, are now declared to be untenable by the specialists. Among these even the law of gravitation and the law of the conservation of energy are included. And what is more, from more than one side they are demanding that the concept 'natural law' shall be dethroned. *Dingler* cries: "Nothing, no nothing, is certain anymore." *Herz* sighs: "We can never have more than an image of reality." *Herman Weyl* says: "Matter has finished playing her role in natural science." *Mach* advises that we stop trying to explain the phenomena of nature and be satisfied with a description of them. Already in 1896, at the jubilee held to celebrate the 55th anniversary of his professor-

ship, *Lord Kelvin* said: "The result of my work can be gathered up in one word, and that word is: Failure!" And since then others have made similar statements.

The scientific world, then, stands today before this oppressive question: What now? There is an almost universal conviction that a "voraussetzungslose" science needs to be called an abortion. It is becoming clearer and clearer that every philosophy, also a philosophy of nature, needs to be supported by a world-view, at least, if one really wants to get an answer to the burning first and last questions. The numerous world-views can be led back to three heads: The *unbelieving,* the *accommodation-Christian,* and the *consistent Christian* or *Calvinistic.*

The first of these, the *unbelieving* world-view, offers nothing to hope for, and everything to fear. It is the real cause for the present-day malaise in the philosophy of nature. It has pushed science into a swamp

wherein it is in danger of choking to death.

Neither can the *accommodation-Christian* world-view offer sufficient help. It is advocated by Rome, which, like in the days of *Thomas Aquinas,* always halts upon the two opinions of rationalism and revelationalism. While even the Thomists admit today that the natural science data of their spiritual father in the fields of natural science, physiology and astronomy are not only deficient, but for a large part false, yet, they do not modify their method. The Romish students of the exact sciences are usually in harmonious accord with the unbelieving natural science. Books on physiology, biology and geology, in which the theory of evolution is starkly honored, receive the ecclesiastical imprimature without any scruples. Theology works night and day to get an explanation of Scripture which will hand out to the unbelieving theories a diplomat's vise. Roman Catholic science displays a remark-

able adaptability, very much like the Roman Catholic missions have often shown. As if by magic their missions often made saints out of idols, even as now Darwinism is 'touched up' to make it appear Christian. With one hand it throws out the life-line of revelation to the drowning philosophy of nature, while with the other it manipulates a long pole with which it continually keeps shoving the poor fellow away from the dock. The same thing is true, and sometimes in a greater measure even, of that world view which seems more and more to be a product of Lutheranism. It also has an accommodation-diplomacy. The most typical illustration of this is *Ritschl.* He rents two pieces of land, separated by a large body of water, and gives one to science and the other to religion. Neither ship nor air-craft can cross it. And yet, these areas are both in the same world, both in each human. Science may contend what it will, religion will

not bother it. Science is sovereign in the visible; religion and morality are sovereign in the invisible. While others have formulated it in other ways, the fundamental thought is found also in those who are not Ritschlians. In connection with Einstein's theory of relativity *Karl Heim* has said that the ideas of *Ritschl* must be carried on much further. Religion does not even have its own field, but only a mere *point,* a point away up in the air, from which point man can overlook and appreciate everything. And not long ago *Dennert,* the great champion against Monism, who has spent his whole life contending that the Scripture has meaning also for the natural sciences,—this *Dennert* has published a book recently which makes us ask: Et tu, Brute? You, too, *Dennert?* In this book he says that faith has nothing to do with the matter of the age of the earth or of the human race. That has got to be left to the judgment of

science. You see unbelieving science is looked upon with favor everywhere, even though it be a chronic patient. One compromise after another is made with this world-view. But what agreement is there between the two?

Only the Calvinistic world-view can create any order in the chaotic condition of science, because Calvinism is the most consistent and harmonious Christendom. It puts all rationalism under the ban. Human reason is not considered an autonomous power, but a gift of God which must always remain subject to the revelation of God. Knowledge is not cut off from faith, neither has it the right to exercise dominion over faith, but it must itself be guided by faith. Nature is a product of the Creator, and whoever wishes to be taught concerning the origin, the purpose, the essence of nature, must sit down at the feet of the Creator as an un-knowing child. Only in Calvinism do

you find the correct appreciation of nature. It has an eye for all the disharmony in the world through its unsparing doctrine of sin, while the doctrine of common grace helps it to see everywhere traces of the original harmony. It confesses that God is infinitely transcendent above nature, but that at the same time He is immanent and that He works in the smallest particle of matter and the most minute cell. Calvinism casts no furtive glances at the unbelieving science; it does not beg; it does not dicker with it; it does not accommodate itself to it; it lives exclusively out of the Father-hand of God.

That is why Calvinism, which, according to *Troeltsch,* is "die eigentliche Hauptmacht des Protestantismus," is appointed to serve the world by furnishing a believing philosophy of nature. Would that the Calvinists could understand that this is the psychological moment. Voices from the world of natural science tell us that they are at

their wit's end;—perhaps they will listen to what Calvinism has to say now. To be sure, one cannot, by magic cause a Calvinistic philosophy of nature to come forth out of the earth. It will take time. But we can at least begin with it. Theologian, philosopher and the student of nature must work together here. Let not one wait for the other, but let each do what his hand finds to do. Permit me to make my modest contribution to this task in this and the following lectures. And we shall write at the close of this work the words with which *Swammerdam* concluded his dissertation: Soli Deo sit laus, honor et gloria.

The Principles of the Calvinistic Philosophy of Nature

Chapter II

THE PRINCIPLES OF THE CALVINISTIC PHILOSOPHY OF NATURE

At the close of the preceding lecture I called upon the student of nature, the philosopher and the theologian to work together with united powers toward the production of a Calvinistic philosophy of nature. In speaking today on *The Principles of the Calvinistic Philosophy of Nature,* I am presenting a subject for the discussion of which the work of the theologian cannot be missed.

First of all, however, I must make an apology. Up to this time I have used the expression 'philosophy of *nature,*' although I am convinced that the term is incorrect. It has its origin in the rationalistic, speculative philosophy of the 19th century. *Fichte* thought of nature as the non-Ego

which was posited by the Ego. To *Hegel* nature was a phase or stage in the self-evolution of spirit. *Feuerbach* said that nature was the system of reality which is purely external and which offers a basis for spirit. Nature and spirit were placed over against each other in opposition. In harmony with this conception the sciences were divided into natural sciences and the spiritual sciences. Some suggested another division, but could not gain approval for it, because the contrast of nature and spirit had gone down too deeply to allow of a change. And yet, we cannot and may not assent to this. Whoever conceives of nature as being the totality of everything that comes within the scope of the senses, that which can be counted, weighed and measured, in a word, that which belongs to the ponderabilia, is doing an injustice to nature as well as to spirit. It is an injustice to nature, because the crown is taken from its head, for it is in spirit that

nature finds its culmination. It is ruled by spirit, just as the head rules the body while, at the same time, it is a part of the body. And such a divorce between nature and spirit is just as disastrous for the spirit. It is put out of doors without the form even of legal procedure. Its influence upon nature is far less when it finds itself outside, than when it finds itself inside. Even though one should recognize the superiority of the spirit over nature, this would not compensate the denial of the natural relation between the two. And what is worse: the contrast between 'nature and spirit' splits the human personality in two. The body of man is part of nature, but his invisible heart becomes a little world all by itself. But whoever mutilates the human personality, lays hands on one of the most glorious possessions given us by God. Here, too, it applies that what God hath joined together let not man put asunder. And this divorce must

avenge itself—it could not be otherwise. The natural sciences and the sciences of the spirit were usually in a state of enmity during the 19th and 20th centuries. In their high flight the former looked down upon the latter as becoming increasingly smaller, as being nothing but toys, fit for fantasts and simple folk; and the latter in their turn thought themselves to be exalted like aristocrats above the banalities of those sciences which used measuring-rods and scales, and tests which soiled the hands and smeared the clothes. Both viewed each other as inferior, and the prestige of all of science was injured thereby. Do not ask: what does it matter whether the term is more or less correct? What's in a name? The fact is that incorrect names foster incorrect ideas. And so, while I continue to use the term 'philosophy of nature,' I do so because the range of these lectures is not sufficient to raise or attempt to solve such a radical problem. I

would have to make my new terminology acceptable by offering a long list of choice arguments, for which we have no time. Therefore, if you will remember that with every mention of the term 'philosophy of nature' there is a silent protest in my head and in my heart, I shall appreciate it.

The elements out of which a philosophy of nature must be put together are the following: *principles, data, results, hypotheses, theories, and propositions borrowed from philosophy in general and from the philosophies of the other separate sciences.* With this statement I am immediately touching upon a point at which the Calvinistic philosophy of nature conflicts with most of the others. Usually there is the opinion that a few of the elements which we have mentioned *can,* and *must* be eliminated. They are thought of as being factors of dissolution rather than constituent elements in such a philosophy. There are some ex-

tremists who go so far as to separate natural science and philosophy of nature, denying the right of existence to the latter. According to them natural science is rich and so inclusive that a philosophy of nature is superfluous. It is at the peak of the sciences,—yea, it is *the science*. It operates only with data, results, hypotheses and theories. That which is added, namely, principles and philosophical propositions, is mystical and metaphysical; and the mystical and the metaphysical must be looked upon as the refuse of human knowledge. It may have value to dam some pond, but in the tidy city of science it cannot be tolerated. *Hugo Munsterberg* said: "Important for us is the fact that natural science is bound by its presuppositions never to acknowledge any unmechanical life-energies, any super-natural influences, any mystical agencies." Natural science, so men conclude, owes its success to this, that it is absolutely neutral, and that

it has nothing to do with those principles which are the products of specific world-views. Chemistry, physics, botany, zoology and others gather data and register them carefully. The phenomena are catalogued according to rules of mathematics in time and space, and, if possible, coordinated by means of formulated laws. And that is considered to be sufficient. The positivistic and phenomenological schools object to going one step further. According to *Mach* and *Kirckhof,* the celebrated constructor of the spectral-analysis, we must be satisfied with the description of phenomena. The idea of causality is replaced by *Mach* with the idea of function. Men in these circles agree that the philosopher of nature must be cast out of the synagogue of the natural sciences as an imposter, an alchemist or an astrologer. But nature proved itself to be stronger than doctrine in this view of natural science. They could not obstruct the entrance to

their own homes of all kinds of speculations. It is easy enough to decree: We have nothing to do with the first and last questions, but one simply cannot force his mind not to think about these things. Our thinking does not obey a traffic-officer who, with a wave of the hand, gives the order to stop! Some think themselves to be a second Joshua, and cry out: Mind, stand still! But no miracle happens. The spirit pays no attention to it, but works ceaselessly on. The principle of energy, which was disqualified as a pale abstraction by *Paul Gerber,* is raised by *Ostwald* to a fundamental principle. The greatest of the great in the realm of the natural sciences admit that experimenting and making hypotheses and cataloguing are not sufficient. *Herz,* who certainly is not a child in the natural sciences, said: "Every thinking mind has needs which the student of nature is wont to call metaphysical." The science of nature and

the philosophy of nature may be distinguished the one from the other, but they are never to be separated. The philosophy of nature makes use of the more or less permanent results of the various branches of natural science. It reaps what the natural sciences have sown, grinds it and prepares it as necessary food for the hungering human spirit.

But that is not all. The philosophy of nature gives to the natural sciences means without which the latter could not work. The student of the exact sciences thinks that he has sufficient when he has his data, results, hypotheses and theories. He is proud because the inductive method can give him complete satisfaction. But he is guilty here of woeful self-deceit. Let me present the case temporarily in a simplified and somewhat faulty manner. I say simplified and therefore somewhat faulty manner. To be sure, reality is not simple but, on the

contrary, very complex. And our thinking does not look for the simple, but reaches out for the extremely subtle involved process. For that reason every simple presentation does violence both to reality and to thought. But from the viewpoint of method it may be necessary to use such a presentation, provided we bring in the desired corrections later on.

Apparently the science of nature is placed, first of all, before the *data* or *facts* of nature. These may be defined as objects of *sense-observations*. It is not necessary that they be observed by each individual student. There are data which existed at one time, but which have disappeared. But when, by means of tradition, trusted witnesses guarantee their existence at the time, they must be accepted as data. It is also not necessary that they have been perceived; even if they are able to be perceived, they are to be considered as data. It is pos-

sible, for instance, that an Arab camel driver has for years paid no attention to certain objects in the desert, while a student of nature would immediately recognize them as fossils. Everything that has belonged or does still belong to the reality of nature may be called 'data.' Nature is a domain the greater part of which has not yet been explored, and which holds much hidden data. It is the task of the science of nature to imbibe all these facts, these data. And our observations increase in perfection by means of such inventions as the telescope and the microscope.

After the observation comes the *thought,* the act of *thinking.* Apperception already links up one observation with another spontaneously. But a more purposeful comparison is needed. In this way we get on to the tracks of a certain order and regularity. We discover, for instance, that some fish live only in fresh water, while others live only

in salt water, and that the salmon, although a fresh water fish, ventures out into the sea to spawn. When our mind works with this datum the product is usually called the *results* of science. *Experiment* renders invaluable service here. The purpose of the experiment is to separate the accidental, that which cannot be used in determining the results, from the field of observation. The datum is not always sought in the state in which nature presents it, but it is recalled artificially. That is the way we ascertain, for instance, whether gasses retain the same attributes under various degrees of pressure, or whether some change takes place. It is to the experiment, which came to its full rights in the 19th century that the natural sciences owe their suddenly rising curve. Technology pulled on its seven-league boots. Laboratories became more important as centers for the natural sciences than the open field or the lecture room. In the labo-

ratories those results have been procured which have been confirmed in experience a thousand times, and which have been proclaimed as being certain and immovable.

This form of thought by which we draw conclusions is followed by a special form of thought which can best be given the name of *fantasy*. Kindly take this word without any added meaning. We do not intend to pass judgment upon the natural sciences because they make use of the power of fantasy. For fantasy celebrates her triumphs not only in the domain of the arts. It is just as important a factor in the sciences. It must be appreciated as a talent given by God, not to be wrapped up and buried in a napkin. Without it no science could exist. Without it no system could be made. Every science has its gaps, its hiatus, which only the fantasy can fill up. The definite results of the natural sciences do not form a unity; but the fantasy creates a unity of them.

That is how *hypotheses* are born. When the hypotheses first see the light of day, they are not carried on the arms of experience, neither do they rest upon observation. It is quite possible that these hypotheses are justified later on because continued research has brought to light additional facts. These hypotheses have often acted as an urge to bore for new springs in nature which, when they were found, spouted forth hitherto unknown facts like a fountain. Then the hypothesis could be recorded as a 'result' in the record book of the natural sciences. Usually, however, the fantasy is a bit too bold, and the hypothesis bridges a larger gap than can be reasonably expected of it. When *Newton* extends the application of the law of gravitation to all celestial bodies as well as to the earth, it is a foregone conclusion that this can never be proved experimentally. This would require some research in loco. And I do not yet see the day in which learned men

shall set their feet upon the solid surface of Mars, or the moon, traversing the space thither in a sky-rocket or some manner of air-craft, and much less that they shall return hither to give account of their experiences. But even if they had lived through such a daring feat, there are still worlds which evade all research either because of their number or their nature. The possibility is greater for a casting aside of Newton's law of gravitation—the work of Einstein and others seems likely to do this—than for an establishing of it. So that hypotheses may never be taken as explanations, but as *trials* or *specimens* of explanations. If phenomena arise for which the hypothesis is not adequate, then natural science, if it knows its place, must be ready to let it go immediately.

It is less easy to draw the line which separates hypothesis and *theory*. The language-making masses use them synonymously.

They use alternately such terms as atomic-theory and atomic-hypothesis, ether-theory and ether-hypothesis. I feel that the most plausible distinction is this, that a theory always rests upon a combination of hypotheses. The doctrine of evolution, for instance, could better be called a theory than an hypothesis,—at least, if it has the right to be called either of these two, and not much rather a careless or slip-shod imitation of metaphysics, a conception which is being expressed more and more. In this task of combining hypotheses to form a theory the fantasy has its place as well as our logical thinking, for the group of hypotheses upon which the theory must rest, is never entirely complete. It is the imaginative faculties of man which must fill in that which is lacking.

I have already warned you that in this combining of data, results, and hypotheses and theories, the simplified and therefore the faulty elements may not be lost out of

sight. Let us review this. It is superficial to think that the consideration of data is purely the work of observation, and that our thinking may begin work only after observation has finished its task. But there is no such thing as observation without thought, just as the intellect, the will and the emotion never act separately, but always together. When a scientist finds some data in an earth-stratum, and he cannot immediately answer the questions as to the what and how and wherefore, it is his intellect that whispers: this is strange, it needs more careful research. The only way you can account for a primitive human playing with diamonds as if they were worthless objects, is by saying that their intellect tells them: it is only glass. Observation becomes keen only when the mind becomes keen. One cannot say which is first, observation or thought, for they both function at the same time. And immediately the fantasy enters

as third party. For a long time fantasy looked upon petrified objects as sports of nature. It was *Leonardo da Vinci* who first suggested the idea that these petrified objects were the remains of natural organisms of some earlier time. He certainly did not gain approval at the time. Everyone was sceptical. Today we accept it as datum without a question, while at that time it was an unbelievable hypothesis. In the presence of such elementary data the fantasy of one fought with the fantasy of another. Very few are willing to place themselves today upon the naive standpoint of *Newton* who pretended to make no use of hypotheses and who said that there was no room in the natural sciences for hypotheses. And these few men view the natural sciences in a more narrow sense than did *Newton*. We cannot suppress the question whether in their case we can still speak of science. Fantasy exerts

its influence from the very moment that thought and perception exert theirs.

If this is true, then we must go on to say that the accepted views as to the application of the inductive method must be too naive. Ever since the two *Bacons* pleaded the case of this method, the value of it has been strongly exaggerated by students of natural science. I will not say anything just now about those who think that the inductive method is the only one for the sciences of the spirit as well. Among students of the natural sciences it has become a communis opinio that in their field the inductive method is *the* method, and that the deductive method can result in nothing but calamity. *Newton* was of the opinion that this method could produce a degree of probability which would be equal to that reached by our logical thinking. *Herschell* hesitated to accept anything on faith, and did not even want to make use of the observations of

earlier students of nature, but aimed to accept only that as reality, which he had seen with his own eyes. But he himself taught that the universe was just as boundless as time and space. According to him there is an eternal becoming, in which myriads of worlds sprout like grass in the night. How he has viewed all this with his own eyes is a secret which, alas! he has carried with him into the grave. *Helmholz* will recognize no laws of nature which have not been found by the inductive method. And a Roman Catholic philosopher of nature, *Schwertschlager,* teaches that certainty can be secured most easily by means of the inductive method. He says that induction is really the basis of all deduction, and goes on to defend the rights of an inductive metaphysics. How simplified this all is! They fail to see that there is no possibility for induction if there is not deduction. The fundamental idea of the inductive method, namely that

one can climb from the particular case to the general, presupposes such conceptions as these: the general exists, the particular exists, there is connection between the general and the particular, and out of all this the genuinely deductive conclusion is reached: therefore, we must be able to reach the general through the particular. Every hypothesis contains a general thesis which we try to perceive out of our experience and experiment. The reasoning which is carried on in that case is deductive in character. It can be formulated thus: if this general thesis is true, then these particulars must agree with it. It is a pure mystification when one pretends that the inductive method ever is applied 'purely.' It is interwoven with the deductive method from beginning to end. Even though the inductive method is more evident in the natural sciences, this does not mean that it alone has authority there.

We must point out another naive element.

Natural science lives too much in the delusion that the things of nature are themselves the direct objects which are perceived. Perception, or observation is never direct. Between reality and observation there lies *sensation*. Observation works with the impressions, symbols, signs, images, projections of the things which are found in the consciousness. How these impressions and symbols got there, is a problem of epistemology which I must leave untouched just now. At any rate, consciousness is *one*. Consciousness is not a governmental bureau, or a post-office, divided into rooms out of which an employee shouts at you: "That's not my business; go to window number 7," at which window the young lady tells you smilingly: "First door to your right at the top of the stairs, please," advice which is oftentimes more sincere than it is correct. Consciousness perceives, thinks and indulges in fancies all at the same time. It is not open for

induction from eight to twelve o'clock, and for deduction from two to four o'clock, but is open for either both night and day. The government-employee idea does not fit the case; it is much too complicated. But neither is our consciousness served by the simple method. It is fitted out to deal with the complicated.

But let us imagine the absurd for just a moment. Let us suppose that the natural sciences used only the inductive method, and that not only its data, but also its results, hypotheses and theories were based upon that induction. What would be the result? It would be this: it would lack the element of certainty. We certainly cannot deny the fact that mistakes enter in when data are recorded. At the beginning of this year a shocking rumor was heard throughout the world of the natural sciences, namely that a skeleton of a dinosaur had been discovered in the neighborhood of Tetoean, in Spanish

Morocco. Several learned men hastened to the place. And what about it? It appeared that the supposed skeleton was really a mower which had been used for the last time in 1917, and had since then been buried under the sand and mud. To be sure, all mistakes are not so crude and cannot be detected so easily, but every branch of the natural sciences can give you a list of them. Even the name hypothesis suggests that it is not a certainty. How many have not had to be given up? How many are not tottering now? Discarded hypotheses are scattered over the entire world. To go on, if induction is really going to lead you up to the general, it will first have had to investigate each and every particular instance, without fail. Some have denied this. Complete induction, so they say, is not necessary. It is not a matter of the number of the data, but of their nature; not quantity but quality. The illustration which is supposed to prove this is

that of *Robert Mayer,* concerning whom it is said that he discovered the law of the conservation of energy through only one datum. But this illustration, while it is supposed to act as lawyer really is the hang-man. For the law of the conservation of energy has been attacked by *Carnot, Auerbach* and others, and is not at all as fixed as some think. These men say that the science of thermo-dynamics shows that energy is continually subject to decrease. An individual case may help a hypothesis, but it can never give it immovable certainty,—no, not even if it be multiplied by thousand times thousand. *Boyle's* law seemed to be able to live through the test of all observations, until the Dutch scientist *Van der Waals* discovered deviations. That was the end of that law. We must admit that the *quality* of the data must be considered as well as the *quantity.* But until the quality of *all* the data has been proved, we are not in a position to

lay hold of the general, and are merely making a throw at certainty. And when will the quality of the data have been sufficiently investigated? At least not before the end of the ages. But this transforms the certainty of induction — provided we had nothing more—into desperation. Naturally, a deduction which is based upon induction can give us no gain. Certainty cannot flow forth out of a fountain of uncertainty.

The certainty of science—also of natural science—stands or falls with the question: are there then no *a priori truths* which precede both induction and deduction, and which do not have to be discovered by them? Whoever places himself on the view-point of the "Voraussetzungslosigkeit" of the natural sciences, must choose between illusion and despair. He must move with his thoughts into an unreal, and that means an untrue, world, or he must dare to face all reality but doubt all truth. On the contrary,

whoever recognizes such *a priori* truths recognizes, at the same time, the existence of principles in science. For those *a priori* truths *are* principles. The principles function as directors, as powers directing all inductive labor, and they give us the primary matter for deduction, for deduction is doomed to unemployment if there are no judgments from which deductions can be made. How do we arrive at such principles? Not through thought or experience. At best these give us nothing but hypotheses which contain more or less probability, but which always are disputable. If there are to be any principles, they must come along some other way. And there is no other way but this one: Revelation through a Spirit who is exalted above the human spirit, giving truth and certainty. That to us is the revelation of Him Who does not merely have truth, but Who is the Truth, the revelation of God.

A difficulty seems to arise here. Does that

revelation contain anything about *nature?* Is not the purpose of revelation to teach man to know *God?* Taken by itself, no objection can be made to this. But in this revelation which God has made to mankind we may not abstract God from His work. That revelation does not know a deistic God who pays no attention to the world, but a God who cares for the world. And so it tells us of the *acts* of God. And nature belongs to those acts of God; nature as a whole, but also in its variety; nature as creation, but also existing in a multitude of creatures. And what Scripture reveals about nature has normative value for the natural sciences. They who honor a dualistic theory of inspiration, saying that only the religious-ethical truths of Scripture are binding, but that its authority does not hold in what it says of other matters, mutilate the revelation of Scripture. A philosophy of nature which advocates the doctrine of evolution,

defending its position by saying that the record of creation as contained in the Bible means merely to express a religious-ethical truth, thereby seeking a way of escape, is guilty of insincerity. The choice must be made here between a consequent transformism—but then the entire Scriptures must be declared to be untrustworthy — and a recognition of the complete truth of the Scripture, in which case the doctrine of creation must be accepted unimpaired. The authority of the Scripture demands not a half, but an entire subjection, not a subjection with reservations, but a complete subjection.

In this connection the question is often asked whether the general revelation does not teach the principles for a philosophy of nature just as well as the special revelation of the Scripture. The question betrays the longing to return again to the lost Paradise. If mankind still lived in the state of inno-

cency, if nature were not cursed, if the intellect were not darkened, then the revelation of Scripture would be entirely unnecessary. But even though, thanks be to the work of common grace, the knowledge of principles for a correct view of nature taken from the general revelation has not been completely lost, still it is not sufficient. The fact that a primordial principle for the philosophy of nature as, for instance, the creation of the world, cannot be found in any pseudo-religion or heathen philosophy, is sufficient evidence for this. And if that most important principle cannot be gotten out of the general revelation, which the heathen have as well as we, how much less any other principles. The contention that the general revelation has a value as source of knowledge equal to that of special revelation, is contradicted by the facts. It is only through the Scripture that the original revelation can shine forth again for our muffled spirits.

We are directed to the Scripture for the principles for a philosophy of nature.

I emphasize this: for the principles of a *philosophy* of nature. The Scripture does not contain *data* of nature. These data are to be found outside of the Scripture in nature itself. It does not give you any results of natural research, and certainly does not build any theories or hypotheses. That task it leaves to the human consciousness. Whoever, therefore, attempts to construct the natural sciences only from the principles revealed in Scripture, would act contrary to the sense and meaning thereof. He would disregard nature itself, and would thereby disregard a work of God. Scripture would call him a sluggard, because he would not direct his thinking to the ants and other creatures in order to become wise. Scripture does not discharge the exact research and the thinking based upon it, but requires both by giving the principles. Otherwise

the principles would lie unused, and that is forbidden. And so, quite correctly, the Calvinistic doctrine of science insists that the Scripture is no manual for chemistry, physics, geology, astronomy and other branches of natural science. Consequently it does not speak the language of science, but that of everyday life; for those principles have value not only for the student of science, but for every believer. Every believer must know that God created heaven and earth, that He has laid down ordinances for the heavenly bodies which they cannot break, and that He has made man in a special fashion, after His own image. Principles are never one-sided. To forestall any misunderstanding, let me add immediately, that the Scripture is not a manual for *theology* either. Take church history, for instance. Scripture tells you nothing about the Papacy, the Reformation, Arminianism, or the Pilgrim Fathers; neither can you

learn from it anything about the course of the church through the history of the world. And yet, church history cannot be written without the Scripture, for the Scripture defines the nature, the essence of the church as well as the nature of history. Scripture narrates the origin of the church and tells of its future. Even theology finds in the Scripture only the principles with which it must work unwearied.

If the student of nature accepts by faith the principles which the Scripture gives for a philosophy of nature, using them as points of departure just as he would use a priori judgments, then he possesses a certainty which can never be excelled. For the certainty of those principles rests, centrally, in the witness of the Holy Spirit. That is why they cannot be thrown away by arguments; and that is why they may never be put on the same plane with hypotheses and theories. It is the demand of the Calvinistic

philosophy of nature that the moment an hypothesis or theory comes into conflict with a principle, it must be dropped immediately. There may be no hesitation here. At this point an inexorable 'must' obtains. Facts are stubborn things, but principles are even more stubborn. They have their roots in the infallible Word of God. They are guaranteed by God's own Spirit.

Since principles have an air of sanctity, one ought to be careful never to point out as a principle that which in reality is not a principle. I have already reminded you that the Christian sciences have sinned in this respect more than once. Because of the influence of heathen philosophies it sometimes gave to Scripture a meaning which was itself foreign to the Scriptures. By permitting its exposition of Scripture to be controlled by the Ptolemaic cosmic-system, it has brought blame upon itself. This ought always to be a lesson for us. Through

conscientious exegesis the Christian philosopher must see to it that, in order to favor any one hypothesis or theory, he shall never put a principle *into* the Scripture. He must give a painfully accurate account to himself to show whether he actually received the principle by means of the revelation of Scripture.

Now, what are the principles for a Calvinistic philosophy of nature? While this can be discussed better and more extendedly in the following lectures, it may be well to mention them here and thus satisfy possible curiosity. I will not touch here upon those principles which act as points of departure not only for the philosophy of nature, but for other sciences as well. Among these there are, to mention a few, the epistemological principles: the objective reality of the world outside of us, the relative trustworthiness of perception and thought, the relation between being and consciousness,

truth and reality, subject and object, faith and knowledge. I must also take away every illusion as if it were possible to give you a complete list of the principles for a Calvinistic philosophy of nature. Scripture is inexhaustible for the natural sciences as well as for your faith and theology. New problems are arising continually, and these demand a closer study of revelation which study often results in the discovery of unexpected principles. Among the chief principles of the Calvinistic philosophy of nature there are these: *The origin of the cosmos by means of creation,* so that speculations about the eternity of matter or of force must be put aside unreservedly; *nature, as only a part of reality* and not the whole, by which the sinful one-sidedness of schools such as materialism, is stigmatized; *the unity of nature,* because it is the realization of the plan of God; *the finiteness of nature both in time and space,* which wipes away

with one blow every theory about the infinitude of the universe; *the origin of the great categories of creation such as the heavenly bodies, plants, animals, man, through separate formation-acts of God* and not through spontaneous transformation, so that there are differences of being between these categories, differences which cannot be removed either by forces of nature or human cleverness; *the constancy of nature* in spite of innumerable possibilities of change and development, since creation as a work of God can never be annihilated nor any part of it lost, which does not mean that one must necessarily deduce from this the so-called laws of the conservation of matter or energy; *the polyphylogenesis of plants and animals, and the monophylogenesis of man; the unbreakable connection between causality and finality, between aetiology and teleology in nature,* on the basis of which every mechanistic explanation of the uni-

verse must be combatted; *the discontinuity in nature* as the consequence of sin, and the *partial continuity* as remnant of the original state of nature; the *immanence of God working always and everywhere as an invisible but almighty factor in the events of nature; the culmination of nature in man, who* is of God's family and yet related to the inorganic and therefore destined to rule nature; *the end of the present form of nature through fire in the last tremendous world-crisis* out of which there shall come forth the radically purified and the highly perfected nature of the Paradise of God.

The Calvinistic philosophy of nature is bound to these and other principles. Bound! To the philosopher of nature there is no more unbearable or hateful word. The men of the accommodation-Christian view try to quiet that hatred by hiding many of these binding principles. But the Calvinist, just as stubborn as his principles, repeats it with

a whole heart: Bound! And he goes on to say to the defenders of other philosophies of nature: you are bound no less. You are the slave of your fantasy, permitting yourself to be thrown back and forth with it. You never approach reality. This is the irreconcilable contradiction between you and me: you live by fantasy, I live by revelation. You please yourself with myths, while I find my joy in the Logos Who hath made all things, and Who reveals Himself in the Scripture. Logos or Myth! That is the tremendous dilemma before which the philosophy of nature places us. The non-Calvinistic philosophy chooses partly or entirely for the Myth and at its heart it is nothing but mythology. But the Calvinistic philosophy on the contrary chooses the Logos, and that makes it the only logical and reality-philosophy. It is bound, but her bonds do not annoy. By bowing before the dictates of the Scripture it submits itself to

the leading of the Spirit. And where the Spirit of the Lord is, there is liberty.

Calvinism and the Monistic Philosophy of Nature

Chapter III

CALVINISM AND THE MONISTIC PHILOSOPHY OF NATURE

To a myth there belongs an epic. Since modern unbelieving philosophy of nature has a mythical character, it would be a great omission did not some sweet singer rise up to extol the world-forming acts of nature. But such a bard did rise up in the person of *Haeckel*. The mythical philosophy of nature reaches its highest point in Monism, and it is to this Monism, which alone can save, that *Haeckel* has written his panegyric. He recited it in 1892 before a jubilee gathering of the students of nature in Altenburg, giving it the title: "Monism as the harmonizing factor between religion and science." The audience was carried away into ecstasy. He also called this song a confession of faith, to which he later on

wrote the commentaries "The World-Riddle" and "The Wonders of Life," although in them there are some changes from the original. Permit me to sing his song after him, even though I sing it with less consecration and enthusiasm, and furnish my own melody.

From eternity there was the original atom, and this original atom had power, it had a soul. This original atom was not 'monos,' it was not alone—O you low earthly spirits, do not think that!—it saw a host of original atoms round about, and they glided about in the ether which fills all space. This ether, which was formed, very likely, from thin and hurrying atoms, separated atom from atom. And where the ether was, there was light, for by means of its vibrations this ether brought light and heat, electricity and magnetism throughout all of space. And these original atoms loved some of their fellow-atoms, but others they hated.

The former they drew unto themselves and were united with them, but the latter they pushed far away. Thus world-bodies were formed. And it came to pass—just how, the poet does not say; that is why he is a poet—that the carbon atoms began their organogenetic work. Then an insignificant bit of plasma broke into two equal and similar parts, and lo! there was the first 'Monere.' Organic life began. In this moner-plasm a solid central nucleus separated itself from a soft external mass. The first organic cell pushed its way to the light. Through long aeons of time there were no other inhabitants on the earth than these one-celled beings or Protista. But nature was not satisfied that these cells should be alone, so it said: let there be more sociability. So there appeared the lowest histones and the many-celled plants and animals. All the succeeding cells inherited the characteristics of the former. It was a remarkable moment in this process

of evolution when the monkey mounted the stage. He, too, worked his way up from lower to higher, his greatest achievement being the begetting of the top-ape, the pithecanthropos erectus, the ape-man. He who does not believe it may ask my friend *Dubois* —no, not my enemy *Dubois Reymond,* who is always gnawing on his 'seven world-riddles'—and my friend *Dubois* will direct him to the fire-proof shrine in Amsterdam where this adorable relic is kept. According to the biogenetic law that the race develops according to the periods through which the individual passes before it is born, man existed for thousands of years in a most primitive embryonic state. But these embryonic forms took on higher shapes, until, after innumerable periods of time, man was mature, and presented himself as the historic man. O Muse, punish those who poke fun and say that I am a materialist. Help them to see that they can call me a spiritualist just as

well. For, do not I continually sing the praises of the soul? Have I not glorified the soul of the original atom, the soul of the Protista? And shall I then deny the soul of man? I defend the soul with full music from my harp. The soul is the function of the brain, or, to be more correct, of the cerebral cortex. I defend consciousness; it is the valuable product of the central nervous-system. I defend immortality—to be sure, not individual immortality, as did Plato and Christianity,—but universal immortality, the eternal existence of substance. I defend morality as the balance between egoism and altruism. I defend God against all those who say He has personality, who think anthropomorphically of Him, degrading Him to a "gasiform vertebrate." I defend Him as the most exalted cosmic conception, as the infinite total of all forces of nature and ether vibrations. I even defend the Trinity, for I conclude my Monistic confession of

faith with the words: Let God reign, the spirit of goodness, of beauty, and of truth!

The audience was spellbound. It hung on the singer's lips. It returned home deeply impressed. To this epic *Wilhelm Bolsche* added a kind of devotional literature. How beautifully he meditated upon the life of love in nature! *Carneri* added a system of ethics. *Ostwald,* although himself member of another school of Monism, preached sermons on Sunday. A substitute for a church was organized, officially known as the League of Monists.

But soon the magician's wand broke. *Haeckel* had to drink the cup of tragedy. The monistic scholars left him sadly alone after a short vacation. Today this epic is set to music, and youthful high-school students, or those who are beneath them in development, dance about the jazz-band which plays it. You can hear it in the frivolous atmosphere of the dance-hall of popular science,

but in the laboratories not one line is recited.

But do not think that Monism outlived itself in *Haeckel*. The epic of the monistic philosophy of nature was never used as a funeral march except by those who were overhasty opponents of it. Let no one flatter himself thinking that he will march behind the hearse of Monism. It is not a phenomena of a day or of an era, but it is something that has grown up together with history. It is evident in all of human history as far back as we can go. Modern Monism has a hall of fame which is so large that it cannot be viewed in a day or a month. All peoples are represented there. There you find the learned Chinese *Tscheu-tsi* and the mystics of Taoism; the poets of the RigVeda and the writers of the Upanishads; the identity philosophers of Buddhism. From Greece there is *Thales* who thought water to be the ultimate substance; *Democritus* the father of atomism will draw your attention espe-

cially; *Zeno* and his Stoics; and do not forget *Epicurus* and his school. From the Middle Ages you will see the pantheistic figures of *John Scotus Erigena, Averroes* and *Eckhart*. The time of the Renaissance is represented by *Giordano Bruno, Sebastian Franck, Jacob Bohme*. From the time between the Reformation and the Revolution there are many, among which these are chief: *Spinoza, Leibnitz, Holbach, Goethe*. The 19th and 20th centuries occupy an entire wing in this pantheon, and among the countless number there are *Fichte, Schelling, Hegel, Lotze, Feuerbach, Spencer, Von Nagali, Fechner, Vogt, Buchner, Moleschott* and others. The blow which *Haeckel* gave to Monism by his superficial trifling, was not a death blow. Others took his place and produced new theories. It is evident that in the future statue after statue will be carried into this gallery, there to magnify the glory of Monism. Like other streams of thought

and life Monism has more than once disappeared below the surface, only to rise up suddenly at another point. The present day crisis in the philosophy of nature has affected the present day Monism sorely. But it would be premature, to say the least, to have funeral announcements printed. It may be the case here that they who are declared dead untimely, are just the ones who enjoy long life.

This history of Monism, which I presented 'in a nutshell,' was sufficient to show you that the name Monism covers two diametrically opposed schools. *Spinoza* and *Holbach, Hegel* and *Buchner* are each other's antipodes. The one group is centered about thought, and is mystical and dialectic. In so far as it can be called religious, one can see greatly enlarged pantheistic veins running through it. The other group, on the contrary, claims to be based upon the data of nature, having experiment as its chief

weapon. While there are some inconsistent spirits sheltering under its wings, the consistent thinkers are known as atheists. We can distinguish them as the *rationalistic* and the *empirical,* the *metaphysical* and the *nature-philosophical.* The supremacy of the one or the other depends upon the world-view which is dominant, and the conditions of culture round about. When man has degenerated to primitive life and his needs are chiefly material; when, after a period of economic oppression of the masses the spirit of revolution becomes active and finds the real joys of life in sensual enjoyments; when culture has reached its peak and men seem to be saturated with it, and long with an irrepressible desire to live as closely as possible to nature or when technology, based upon natural science, gives one invention after another to man, then the natural-philosophic monism may assure itself of revival. In circumstances contrary to this

the metaphysical or rationalistic monism will have a better chance. No person, no matter how influential, and no thinker, no matter how genial, can alter this.

According to the introduction, I am to measure Calvinism with this natural-philosophical monism. My reason for doing this is not merely the fact that the nature of these lectures demands it, but also because the natural-philosophical monism is the great danger threatening Christianity and Christian science today. For the time being the metaphysical monism is out of consideration. Our time is characterized by a return to primitiveness. In European art the attempt is made to be even more naive than the primitives. In science huge palaces are erected for those branches which deal with the visible reality; no installations are too costly, no teaching force too much; they are pampered in every way. In the other branches expenses are cut down; they are

treated—sometimes mistreated—like step-children.

What characterizes this natural-philosophical Monism? Chiefly this, that it seeks its point of departure in *one* of the elements of natural science whether data, results, hypotheses or theories, and considers *that* to be primary in all of nature and interprets all of reality in terms of it. One of the most persistent opponents of *Ostwald* says of him: "He has blinds which make him look upward." This does not sound very modern in a time when the horses are being replaced by the automobiles, but even now it can be understood. According to this critic, *Ostwald* always looks only in one direction. That which lies to one side or behind simply does not exist. That view characterizes all Monism, but especially the natural-philosophical monism. The deathly disease of one-sidedness undermines it. It shuns plurality, in which reality displays itself, and chooses

the individual out of the many. The attributes of the individual are attributed to the many, so that the many are identified with the individual. As a result, the natural-philosophical Monism is more narrow than any other world-view. It acts like the owner of a house and garden who meets an explorer of a primeval forest. When the latter describes the exceeding beauty of the primeval forest, the owner of the garden interrupts the enthusiastic explorer: "I can picture it exactly. It is just like my garden, except that the primeval forest is larger and more wild." It is like a miniature Socrates who thinks of all women in terms of his Xanthippe. Its method consists of generalizations carried to the extreme. If all Monists would start out from the same datum, or the same hypothesis, then this view would at least give us a unity. But that is not the case. One lets his eyes fall upon this datum or hypothesis, and the other upon that. That

is why the various schools within the natural-philosophic Monism are countless. Every phenomenon can do service as explanation for the others. There is no world-view *less monistic* than Monism.

I shall not, out of respect for you, begin to read the catalogue of diverging monistic nuances which such men as *Eisler, Klimke* and others have compiled with such care, but which always remain incomplete. I am afraid its effect upon you would be similar to that of a sleeping powder. I would rather attempt to make a division based upon the fundamental ideas with which the philosophy of nature works: matter, energy, law, life and soul, time and space. But I ask you to remember that there are many mutations. There are no missing links here. Combinations multiply by the day.

First, then, the *materialistic* Monism. This brought Greek philosophy into existence. The Ionic philosophers of nature pro-

pounded the thought that one primeval substance was the basis for matter. The Stoics followed this track and built a refined system. *Democritus* was the giant of the ancient materialism. He exchanged the element for the atom. According to him the world is full of atoms which move freely in the void. These atoms are the indivisible physical component parts of the world, differing only in size and form. The soul is the smallest, lightest and the most perfectly formed atom. It moves through the body with remarkable speed. The movement of the atoms is caused by external forces, stress and push, resulting in union of the atoms or separation. Worlds come into being and pass away with absolute necessity. This thoroughly materialistic monistic philosophy has been under the ban for centuries, placed there by Aristotelianism in league with Thomism, as conflicting with Christianity. In the 17th century *Gassendi* re-

vived it. He thought of atoms as being bent like hooks, so explaining the coherence of bodies. He said that cold was a special matter having four points which caused the sensation of pricking. *Boscovich* believed that atoms were material force-points in space. *Dalton* tried to get closer to the atom by means of experiment, and it was his atom-theory which stated that all homogeneous matter consists of atoms which are all alike in all their attributes. This theory received general acceptance. As someone has written; it was *Dalton* who exalted the atomistic view of the ancients to a theory in natural science. Besides, *Wohler* succeeded in making urine artificially, as a result of which many hesitated to believe any longer in a special life-force, and thought that the processes in organic nature proceeded along the same lines as those in inorganic nature. These and similar hypotheses were looked upon as the real foundations upon which material-

istic Monism could be constructed like a mighty capitol. *Carl Vogt* insists that this alone has the right to be called 'science,' and whatever does not conform to it he stigmatizes as a "collier's faith." He says that the relation of thought to brains is about the same as the relation of gall to the liver, or of urine to the kidneys. *Moleschott* saw in force an inseparable eternal immanent attribute of matter. Thought is a movement of the brains. *Buchner* felt that he might conclude that there is nothing immaterial. Force has no independence, but is dependent upon matter. The human soul is identified with the brain, and God is nature. And *Ueberweg* commanded: let the materialists shoot all Roman Catholics and Protestants along with the old rationalists, even though it takes thirty years to do it, for mildness and humanity will not come back until the bloody victory has been gained. All materialistic monists did not

suggest such Bolshevik methods, but they do all share a certain brutality. They are not able to raise themselves above crude matter, which is for them the essence of reality.

It is quite possible that the 20th century man would have turned aside from this materialistic Monism because of its crudeness, had it not been modified by the *electric Monism.* Electric phenomena were not entirely unknown in ancient times, but these later centuries were destined to look into the matter more fully. On the basis of their investigations such men as *Galvani, Volta* and *Davy* reached the conclusion that besides a friction-, an atmospheric-, a heat-, an animal-electricity, there is also a contact-electricity. *Faraday* reduced these to one principle and taught that electricity and magnetism were interchangeable. Light and spectrum analysis, theories of light and ether all contributed to the opening up of

new roads. The chemical atom-theory was found to be incorrect. The atom, which up to this time had been looked upon as indivisible, appeared now to be very complex. There were some who scorned the atomic theory by saying that atoms and molecules had never been observed directly, and never would be observed in that way, but their opinions have had to be reversed, for since the beginning of this century scientists have succeeded in observing the actions of the atom, they have separated them from each other, and have even succeeded in photographing the paths of the atom. An entire planetary system was discovered in each atom, of which system the electron formed the center. According to the theory of *Lorentz,* which has since been corroborated by the so-called Zeeman-phenomenon, this electron moves back and forth within the atom, and sends light waves out into the ether. *Bequerel* and the *Curies* succeeded in isolating

a radioactive substance, radium, and the strong rays which this radium sent forth were separated into three, the alpha, the beta, and the gamma rays, the first consisting of positive ions of helium-atoms doubly loaded, and the second consisting of free electrons which move with the speed of light. *Balmer, Rydberg* and *Ritz* propounded the laws for the spectral lines, *Rutherford* projected a model of an atom, *Planck* and *Einstein* computed the rays-quanta, upon which *Bohr* based his hypothesis of the mechanical paths. This research has not yet been completed. New perspectives are being opened continually. Electro-dynamics has a large future before it. The scholars who keep themselves busy with this electric Monism are aware, at present, of the lacunae in their theories. The problem as to how the motion of the electrons must be explained gives special concern. *Poincare* suggested a solution, but it was not favorably received.

Because of all this uncertainty they have not yet ventured to talk about religion and morality, but we may be sure that as soon as this Monism enters the period of popularity, they will not be able to keep from doing it, at which time it will be revealed in its true nature as atomism. For whether one goes back to electrons or to ordinary matter makes very little difference. The electric Monism will receive the same judgment as the materialistic Monism.

Energetic Monism was born as a reaction to the materialistic Monism. In so far as the ancient atomism permitted the influence of force upon matter, it was dualistic. *Rumford* and *Davy* maintained that position. Heat was related not to matter, but to force. *Davy* talked of two basic forces in nature, attraction and repulsion, just as did *Democritus*. But gradually force became the object of reflection. *Robert Mayer* said that there was only one force or energy which

penetrated both the dead and the living nature, and there were many who repeated this after him. But when materialism said that force had no independent existence but was merely an attribute of the atom, *Ostwald* defended the other extreme, and denied the existence of matter, defining it as a complex of energies which appear as weight-, form-, volume-, chemical-energy, with which heat and electric energy are related in a variable manner. All these energies are dependent upon one another. Organisms are permanent figures or forms through which various energies flow continually. Consciousness is a function of nerve-energy, and even the psychical is a link in this chain of energies. "I am convinced," wrote *Hermann Weyl,* "that matter has played its role in natural science. Natural science must get rid of matter as extension, but must look upon it as action, as an acting factor." There are Christian thinkers who feel that up to a cer-

tain point Monism can be accepted, but they are mistaken. For Monism wipes out all boundary lines in nature, and hundreds of riddles are simply ignored. It decrees that force does not need matter as a basis, but makes no effort to make the decree acceptable. This energetic-Monism advocates a naturalism in which the supernatural finds no place for the sole of its feet, just as clearly as the materialistic Monism.

Mechanistic Monism needs next to be noted. Do not infer from this title that the brands of Monism to which we have already referred do not accept a mechanical action. On the contrary that is the only action they do acknowledge. The difference lies here, namely that they accept *matter* and *energy* as principles, while the mechanistic Monism chooses *natural law* as its principle. For this latter Monism it makes no difference whether matter or energy is primary, or what constitutes its essence. The main thing

is, according to *what law* does everything in nature progress, a position which has its analogies in ancient philosophy. The Eleatics looked at natural phenomena and talked of the law of *being,* and *Heraclitus* talked of the law of *becoming.* The genius of *Archimedes,* the Greek Edison, secured for the laws of mechanics an unheard of high respect. But it was not until the time of *Galileo, Kepler* and *Newton* that the natural laws gained a new emphasis, and reflection upon them began. They attempted to get at the world-law. *Lavoisier* said it was the law of the *conservation of matter; Robert Mayer, Joule* and *Helmholtz* said it was the law of *conservation of energy,* while *Haeckel* united them into the law of *conservation of substance,* betraying thereby his dilettantism rather than ingenuity. Even the organic was tied to such laws. Every law of conservation found acceptance except the law of *conservation of species. Max-*

well announced the proposition that the natural laws are extensions of the laws of mechanics. *La Mettrie* and *Holbach* thought of man as a machine, an idea which is still abroad in the medical science. Unintentionally someone has recently delivered a wonderful persiflage of this. A machine-man had been constructed, having a steel frame and the clothing of a man. He could walk like a globe-trotter and sit like a prisoner. He made the journey all alone from Sweden (I think it was) to an exposition at Barcelona. On his chest there was a card asking everybody to help him reach his destination. He had to be taken from one train to another. He did not visit the dining car. He was 'dry' but not for moral reasons. The beauty of the Perenes did not attract him. The most helpless war invalid was more clever than he. He could not even laugh at the mechanistic Monism; others had to do that for him. Indeed, this entire view of

things is being thrown into a fiery oven, and faith in the biggest of nature's laws is being shaken. There is not an angel to guard.

But still another form of Monism must be mentioned. It is the *geometrical* Monism. And this, too, can be connected up with ancient thought. The Pythagoreans explained the world by the number; 1 was the point, 2 the line, 3 the plane, and 4 the body. The relation between objects was expressed by number and thus their relativity shown. It is difficult to deny a similarity between the theory of relativity of *Einstein* and Pythagoreanism. *Einstein* imagines a space with four dimensions, in which time is the fourth dimension, and within which all that is finds a place. The Pythagoreans said that 10 was the perfect number. And now *Rieman* talks of 10 magnitudes—*Einstein* calls them gravity-potentials—which limit the attributes of space. *Einstein's* idea of space is not a form of thought, but the totality of our measure-

ments, and its attributes can be established experimentally. It is physical in character. Although this Monism has not yet been perfectly developed, and the thought of the finiteness of the sensual nature has great attraction for us, still, this can be posited even now, that it will send into exile the metaphysical and the faith in the immanence of the Absolute in the cosmos. As soon as it makes its conclusions known, protests shall have to arise in the name of religion and of Christian science.

In all these monistic schools the vital, the soul, the consciousness was accepted merely as a secondary and accidental phenomenon. It is therefore not cause for surprise that a new system of Monism was discovered, in which these neglected realities were rehabilitated. I want to call that the *animistic Monism.* And this is divided into two sections of which the first is *Hylozoism,* which says that there is life and undeveloped con-

sciousness in the original atom, a view of which *Haeckel* is a typical representative; while the second, *psychomonism,* is under the influence especially of *Fechner,* although all of his followers are not in agreement. In hylozoism the emphasis is laid upon the matter, the substance of the atom; in psychomonism it is placed upon the psychical. I say psychical, not psyche; for the soul as having its own substance is denied beforehand. For *Fechner* the *one* reality has two faces, a night face and a day face. The night face is stern and rigid, it expresses no emotion, it abstracts things from their qualities, it is mechanical and physical. The day face gleams and glows, it permits things to keep their qualities, it is organic and psychical. And even as life is before death, so the psychical has preference to the physical; but neither can exist without the other. There is no reciprocal action; there is only a parallelism. The psychical is subject of

sensual observation as well as the physical. Where there is the physical there is also the psychical. The earth, plants, the crystal have a soul even as man. In the universe there is an ascent of consciousness. In this cycle an organic evolution is accepted along with a mechanical evolution. The entire cosmos is the body of God, Who is the All-spirit. Pantheism is the keynote of *Fechner's* system. And even though other psychomonists are more pantheistic or more atheistic, and though they are not as bold in their speculations as is Fechner, yet none of them give to the soul that which is the soul's, nor to God that which is God's. Both schools remind us of the animism of the so-called nature-peoples.

It will seem superfluous to give a detailed criticism of this natural-philosophical Monism. The chief faults have already been mentioned,—simplification and generalization. All Monistic theories have this in common:

they become enthused by a small part of inorganic nature, and the rules which they set up for this small part they apply with unreasonable haste to all of the inorganic world not only, but also to the organic. They want to dress a giant in the clothes of an infant. They wring, they squeeze, they boil nature so that they can put it, all sterilized, into their canning-jars. Differences in reality are said to be differences in thought, and they let the vacuum sweeper vibrate over those differences in thought until they are worn out. They work with data, results, hypotheses and theories, they use all their genius, they poetize and 'fictionize,' they meditate and invent, they mythologize right lustily. They depose everything that has the appearance of deity, or else they create a God themselves and cry: Behold the God Who has led you out of the prison-house of the Christian authority-faith. They compete against each other and shout to the mul-

titudes: Dance about my golden calf, for the gold of it has more karats and the calf of it has more calf than all others. That is the capital crime of the modern natural-philosophical Monism. It eliminates all principles, all a priori judgments which God, Who has created nature and thus is the only one who knows nature, has revealed in His Word. That is why Vitalism cannot sufficiently oppose Monism. The older Vitalism of *Pinal* and *Bichat* with its manifold life-forces; the psycho-vitalism of *Pauly, France* and *Wagner* with its psychic factors which it gets out of the physical; the neo-vitalism of *Reinke, Driesch, von Hartman, Becher* with its dominants or genes, its entelechies, its unconscious, its super-individual soul,—all these, in their attempt to explain the organic in distinction from the organic vitale, use teleological factors which are pure products of thought, and do not contain any element of revelation. They do

not listen quietly and obediently to the Word of the only wise God. Therefore they shall know no dawn.

Only consistent Christianity, Calvinism, with its principia for the knowledge of nature, taken from God's revelation, especially the Holy Scripture, can point the way here. Calvinism can study nature as nature presents itself. It honors the *plurality* in reality, for it acknowledges that God has Himself brought difference of being between the various categories of creatures, so that a specimen of one category can never jump over into another category. It honors the *duality* in reality, for it knows that the law of duality is found everywhere in creation, that there is a heaven and an earth, an invisible and a visible world, organic and inorganic being, that man consists of body and soul, that the body is built symmetrically, having two eyes, two ears, two nostrils, two hands and two feet. But no less does it

respect the *unity* in nature. Calvinism pays tribute to a monism that leaves plurality and duality untouched.

Calvinism draws many of its principles for the philosophy of nature out of the beautiful first chapter of Genesis. It does not rob that chapter of its value by thinking of it as a legend, a symbolic picture, a product of poetic imagination, an object of arbitrary allegorical interpretation, but as a real record of the origin of reality. Thus it comes to stand, first of all, before the one absolute principle: God. Then before a duality: God and the creation, which is not an eternal dualism, for: in the beginning God created. Creation had a beginning. A duality, to be sure, but one of which the terms are not of equal value, for the Creator is infinitely above the creature, and He holds the creature in His hand, so that it cannot so much as move contrary to God's will. And the lesser in this duality is again split

into a duality: in the beginning God created heaven and earth. Here the Divine order of Monism, duality and plurality is stated. With the preparing of the earth you can see the same Divine order. First the earth was a *unity,* even though it was a chaotic unity. In this unity God brought division and *duality;* division between light and darkness, day and night, the heavenly sphere, and the earthly sphere, sea and land. After that He filled the world with *pluralities,* myriads of suns and planets, plants and animals in which there are other pluralities which God created, each with its own nature which it can never lose. You notice the same Divine order in the formation of man, creation's crown. First of all there was *one* man, the head of the covenant of works and of humanity. Then comes the *duality,* for woman was given to man as a help-meet. And immediately you have the command of *plural-*

ity: be fruitful and multiply and replenish the earth. The unity of it all does not do injustice to the duality and the plurality, neither do the duality and the plurality do injustice to the unity. When you see a sky-scraper in New York, you see it as a unity. The fact that it can be divided into two parts, or that it is made up of many kinds of material, does not alter things. If you meet a man of world-renown, you get the impression of *one* personality, although his soul is not the same as his body, and although his body is made up of innumerable small parts. How is that? Because each and every part of the sky-scraper has a purpose given to it by the architect, and it answers to that purpose; because every member of the body has its place and work which it can carry on only in relation to the whole. The same thing holds true for nature. There is purpose there. It is not true, as vitalism would have us believe, that one part of na-

ture is subject exclusively to the law of causality, and another part exclusively to the law of teleology. Everything in nature has a cause, whether material or immaterial, whether known or unknown. Everything has a purpose, the inorganic as well as the organic. For the inorganic world must serve man, in order that man may serve his God. The wonderful variety in nature can be traced back to a First Cause and can be shown to point the way to a Last Purpose. And that one First Cause and that one Last Purpose are the same. *You cannot find a more Monistic view of the world than Calvinism.* It confesses that monism with holy emphasis in the doctrine of foreordination and predestination. All that has ever been in the world, all that is there now, and all that shall ever be in it, lies as a glorious unity in the eternal counsel of God. The divine predestination covers not only the salvation of man, but also all human action,

and even the sparrows which are sold for a penny, and the lilies of the field which are clothed with exceptional beauty, and the diamond which is hid in the earth or which shines right kingly when set in a diadem. If it is true that Calvinism at its best lives by the counsel of God, then it is also true that Calvinism at its best is a monism that cannot be excelled. For the Calvinist there is but *one* power which makes reality reality, which holds it together, fills it, and leads it to its final end: the almighty and everywhere present power of God whereby our heavenly Father, as it were by His hand, upholds and governs all things. The Calvinist believes that he is going into a future wherein this monism shall reveal itself even more fully. He expects, according to the promise of Christ, a renewed cosmos, wherein the duality of heaven and earth is removed; a cosmos that shall be heaven and earth together, for the New Jerusalem shall come

down from God; a cosmos wherein the pathological duality which sin has brought into nature, shall be healed. The Calvinistic Monism is unique because it recognizes duality and plurality and at the same time absorbs them in itself. It stands as the only true Monism over against the divided false Monism. A few years ago a scholar of German extraction who is at present on the staff of one of the Dutch Universities, but who expects soon to take up his work in the United States, wrote that the term "Monism" re-echoes a great homesickness on the part of the modern man, but that it will always remain just a vision. I assure you, on the contrary, that in Calvinism this homesickness will give way to the glorious feeling of being home. I dare ask enthusiasm for that Calvinistic Monism from every scholar. For the well-known words of Augustine, "Inquietum est cor nostrum, donec requiescat in te," I take the liberty of giving this

variation: "Inquieta est cogitatio nostra, donec requiescat in te, solo Deo vero."

Calvinism and the Astronomical Conception of the Universe

Chapter IV

CALVINISM AND THE ASTRONOMICAL CONCEPTION OF THE UNIVERSE

The modern philosophy of nature trumpets the proud note that it has broken the united front of the Christians at one point, at least. Christians have been forced to withdraw in haste as a result of which the power of Christianity has suffered irreparable loss. At best it can carry on some guerilla warfare, but never any more can it carry on a battle on a large scale. No matter where it still tries to assert itself, there is one domain to which it can never return, and that is the field of the philosophy of nature.

It is the modern conception of the universe, so they say, that has made the breach in the fortress of Christianity. Without be-

ing conscious of it, *Copernicus* was the ring-leader of the attackers. He was followed by officers who were equally unconscious of the terrible blow they were giving Christianity. But the natural scientists who followed them saw it much clearer, for they were very much aware of the fact that they were undermining the authority upon which the Christian view of nature was based. Yet, they did not restrain themselves; but, on the contrary, they pursued their victory on to the end. The last of the pre-Copernican leaders were shut up in a cave where they died of hunger. The ancient conception of the universe has fallen like Dagon, and cannot be reconstructed. On the other hand, the modern conception of the universe stands glorious like a Statue of Liberty at the entrance of the harbor of the newer science. The sun of faith has gone down forever, the sun of knowledge has flooded humanity with its morning-glow. And although it is

hidden from the eye for a time because of the crisis-clouds of these days, it makes irresistible progress towards its zenith, and after a while each Christian shall kneel before it, worship it, and cry: Modern natural science is great!

This language of the Rab-Shakeh of this age, has made a deep impression upon the Christian ranks. There are innumerable students of science who have placed the modern conception of the universe upon a pedestal in their halls for fear that they would otherwise be laughed at for their pre-Copernican ideas. Their anxiety prevented them from seeing that the modern conception differed by so much as a heaven's-breadth from the Copernican. In his naivety *Dennert* was of the opinion that world-image and world-view could be separated. The world-image, he thought, is built only from our knowledge of the structure of the world, a knowledge which can be secured

along strictly inductive lines, and, as such, has nothing to do with a world-view. When this world-image has made inventory of the contents of the universe, when it has stated the quantitative relations existing between all the objects in that universe, its task is completed. The world-view, which never operates without principle, stands in no relation to this whatever. Many have greeted this word of *Dennert* as an emancipatory address. Others were less radical. They did not wish to sever the bond between world-image and world-view, but they cut into it so far that only a few threads were saved, but these few threads do not have sufficient strength to draw the two closer together. In practice, therefore, the radicals and the moderates stand shoulder to shoulder. They are of the opinion that the Holy Scripture has no authority for the construction of a world-image. This is believed not only because the Scripture is no

source-book for cosmography, but also because the Scripture presents a pre-Copernican, an ancient, an untrue conception of the universe. *Copernicus* and *Kepler, Galileo* and others did not think this Copernican conception to be contrary to the Scriptures, but these later scientists do. But that is why they did not accept the Copernican conception, which tried to justify itself out of Scripture, but have taken the modern conception of the universe, which has annexed some Copernican thoughts, but is irreconcilably opposed to the Scripture.

You understand, this concession to the unbelieving philosophy of nature brings their position as Christian philosophers of nature into danger. They leave no effort untried to reconcile the modern world-image with the Christian faith. Some of them defend themselves by saying that God has revealed Himself not only in the Scripture but also in nature; and then they put these two reve-

lations on the same plane, as far as their value is concerned, and they say that both have equal authority for us.

But they forget that the Scripture has a prepared form, while nature has not. Scripture expresses itself in words and thoughts, while nature furnishes data which must be used by man, and which is usually transformed into words and thoughts only after a long process.

They forget that the words and thoughts of the Scripture have been recorded with infallibility, while the words and thoughts with which the philosophy of nature works are secured in a way which includes all kinds of misunderstandings and error.

They forget that the Scripture has become necessary, not only to teach us to know the Savior, but also to put us in a position rightly to read the book of nature.

They forget that without the revelation of Scripture the revelation of nature would

be sufficient to make us without excuse in the day of judgment, but that even as the heathen, we would become proud in our imaginations and would fall away into a deifying of nature. The results of our thinking about nature along with the hypotheses which are inseparably connected therewith, may never be used to correct what the Scripture teaches us clearly; but the Scripture may be used to correct our results and our thinking. It is against this fundamental principle that they sin. According to them, the Scripture contains, with undoubted clearness, an ancient conception of the universe; and with their philosophy of nature, of which the modern world-image is a part, they criticize that Scriptural conception. The *perspicuitas Sacrae Scripturae* must recede before the pride of their natural-philosophical reflection. They feel that the Scripture is degraded by this method. They are pressed

from two sides: with one hand they want to hold fast to the Scripture, and with the other they want to let it go. That is why they construct the theory that the Holy Spirit did inspire the Scripture, but that He used humans who were not only subject to the errors of their day, but they wrote down those errors. They hide behind the idea of an organic inspiration. One of them wrote: "if the word 'organic' means anything here, it must also mean that in the writings of the writers of the Bible we shall find man and the human element." To this statement he attaches the question: "Why is the separation between the divine and the human in the Scripture so rarely maintained consistently?" But the expression 'organic inspiration' is a flag that does not cover the cargo. What is really being recommended here is a combination of the dynamic and the dualistic conceptions of inspiration. According to this conception,

the ignorant human is talking in the Scripture just as well as the omniscient God. Ignorant man brought into the Scripture a conception of the universe which we of today think of as a blunder. Is there any reason why there should not be more of such blunders in the Scripture? Certainly those writers of the Bible had other wrong notions than just this one about the universe. But now I proceed to ask the question: why is the separation so rarely maintained consistently here? It is almost unbelievable that this conception of things is gaining ground as much as it is among Christians. And yet we must face the sad fact that Roman Catholic, Lutheran and Mediating scholars yield before the pressure of the enemy. Those who hold the Calvinistic world-view are standing all but alone. They cannot and they may not retreat. They persevere in the confession that the Spirit of Christ so laid hold of the holy men, that

they wrote down nothing but the truth, truth about re-creation, to be sure, but also truth concerning creation; truth about grace, but not less truth about nature. The Scripture is not truth and error, not 'Yes' and 'No,' but truth, and again truth, yea and amen!

That is why the Scripture offers much more than a religious appreciation of the cosmos, as some express it. The very nature of religion involves this. You cannot dam religion. It is like the fertile-making Nile; it overflows the land of life, also the land of knowledge, to its uttermost reaches. Religion and world-image belong together. So it is a sense-less question to ask whether Calvinism still clings to the ancient conception of the universe, for that ancient world-image was related to the ancient, that is, the heathen world-view, and can therefore never be accepted. It is a serious mistake of Christianity that during the greater part of its history it has wanted to force the

Ptolemaic world-image into the Scripture. Not that they accepted it without modifications. They thought of the earth as being flat, while Ptolemy thought of it as being round. This has sometimes led to strange implications. In a former lecture I already mentioned the case of *Columbus*. At this point I wish to add that of Magellan. He had to use all possible force of argument to persuade his men to continue the journey. They were afraid that the next moment would bring them to the edge of the earth over which they should fall headlong into hell. When this did not happen, and the experience proved that the earth was round, theology was ready quickly to let loose its original opinions. Yes, and a man like *Voetsius* found texts in the Scripture to warrant approval of the change in thought. He laid hold of the following statements to justify the new conception: "When he established the heavens I was there, when he

set a circle upon the face of the deep," Proverbs 7:27; "It is he that sitteth above the circle of the earth" Isaiah 40:22. It is an example of epexegesis which does not deserve to be imitated. But all this did not mean that the Ptolemaic world-image was cast away, but rather that it was confirmed. The Scripture was interpreted in harmony with that conception of the world which placed the earth as center of the universe. Not theology, but the *official sciences of the* day demanded this, and these sciences were still standing on the Ptolemaic view. The acute astronomer *Tycho Brahe,* the teacher of *Kepler,* opposed the heliocentric hypothesis of *Copernicus* with mighty arguments. If the earth really moves about the sun, then all the stars must show a parallax, that is, a reflection of this orbit in the form of a little circle which is made in the course of a year. No one has ever seen that little circle, and so *Copernicus* is mistaken. The

astronomers looked and looked, but they did not discover that little circle, until in 1838 *Bessel* succeeded in locating the parallax of a star. Up to that time theology seemed to stay on the safe side by explaining various texts of Scripture Ptolemaically.

But now, is it not remarkable? They who use this as a grievance against theology—and not unjustly—would often like to have theology try such an experiment anew, namely, to put an ancient world-image into the Scripture again, not the Ptolemaic image necessarily, but one that is more ancient still, for instance, one that is orientated to the Babylonian. They allow themselves to be used as horses in front of the chariot of the pan-Babylonianism of *Hugo Winckler* and others, who try to trace back all conception of the universe to the one which existed even before Babylon. And if the theologians are not willing to begin with this work immediately, why, the philos-

ophers of nature will perform the operation on the Scripture. They construct a so-called Biblical conception of the universe. The Romish astronomer *Giovanni Schiaparelli* began this work, and the Romish professor *Alois Conrad* followed him closely. At the present time their writings are agreed to by many others. The biblical conception has suddenly become something wonderful. It has only slight deviations from the ancient world-image to which, in the second century after Christ, *Ptolemy,* by firm systematizing, put the finishing touches. The propagandists for this "biblical world-image" mean the same as those who have held the Ptolemaic view in their cramped fists for many centuries. Both are attempting to reconcile faith in the Scriptures and science at this point. Or rather, to gain favor with science at the expense of the clear meaning of Scripture. But there is this distinction, that the older attempts

at least had the intention of making the Scripture normative for the philosophy of nature, while the newer attempts deny the normativity of the Scripture here, and reduce it to an *absurdum*. Do we need to certify that the last is worse than the first?

I invite you to view this so-called biblical world-image a bit more closely. In brief, it amounts to this: The world is a limited thing consisting of two parts, heaven and earth. Sometimes three parts are mentioned, heaven, earth and sea; and occasionally four, heaven and earth, sea and the deep (Ps. 135:6). The earth has the form of a flat disk. They talk of its ends (Isaiah 11:12; Job 37:3; 38:13) and of its breadth (Job 38:18). It is usually represented as being round (Isaiah 40:22; Prov. 8:27). When mention is made of the 'corners of the earth' as in Rev. 7:1 it means the four directions. The earth is surrounded by water (Job 26:10) and rests upon water,

for the Psalmist sings: "He hath founded it upon the seas, and established it upon the floods" (Ps. 24:2). It is supported by pillars or foundations (Prov. 8:29; Job 9:6; 26:11; 38:5), which give it stability. Although the surface of the earth and its inhabitants may tremble, its foundations are sure (Ps. 75:4). The Northern part, called the upper coasts, is higher (Acts 19:1) than the Southern part; did not Abraham go down into Egypt? (Gen. 12:10, cf. Gen. 46:3, Hosea 8:9). Under the earth is the *tehoom,* the primeval sea, which spouted up in springs at the time of the flood (Gen. 1:2), and to which the superfluous water flows again. The Preacher says: "All the rivers run into the sea; yet the sea is not full: unto the place from whence the rivers come, thither they return again" (Prov. 1:7). Sheol, the hell, must be sought in this primeval sea; for at the name of Jesus every knee shall bow, of things in heaven

and things on earth and things under the earth (Phil. 2:10); and God assures Amos: "Though they dig into hell, thence shall my hand take them" (9:2). Above the earth there is the firmament which is like a metal dome, and which is compared in the book of Job to a molten lookingglass (37:18). Above the firmament are the storehouses of rain (Gen. 7:1), snow, hail, fire and light (Job 38:22). In the earliest times people did not think of heaven as being very high, for in Babel they wanted to erect a tower that would reach unto the heavens. Later on a more exalted conception was gotten as to that distance. The inhabitants of the earth are like grasshoppers in the eyes of Him who is seated above (Isaiah 40:22, cf. Eccl. 1:3). The dome of heaven, which is made of water (II Peter 3:5) rests with its edges upon the edges of the earth (Amos 9:6). The stars are fixed in the underside of that dome (Gen. 1:14-

17), while the third heaven is found on the upper side. This third heaven is thought of as a temple in which God and the saints live. The visible heaven hides God from our sight, while the mountains bring us into closer proximity to Him. The earth, situated as it is between heaven and the primeval sea with its hell, divides the universe into two halves, as it were. The astronomic world-image of the Bible is geocentric.

As you view this construction of the Biblical conception of the universe, one thing strikes you, first of all, and that is, that all texts, whether taken from historical, poetical, profetical or apocalyptic books, are used and explained in the same way. Everything is taken literally, which is sufficient to mark this world-image as sectarian. For it is the sects which always use but one form of exegesis in their interpretation of the Scripture, whether the literal or allegorical. The literal method is used, among others,

by the Chiliasts, the Baptists and the Sabbatists. The Chiliasts subject the profetic books of Ezekiel and Daniel, and the Apocalypse of John to a literal interpretation; the Baptists reject infant baptism because the Scripture contains no literal command for it; the Sabbatists treat the Lord's Day in the same way, because the shifting of the seventh day to the first day as the day of hallowing, is not mentioned literally in the Bible. The men who defend the so-called biblical world-image form a league with these literalists. They have no eye for the wealth of forms with which God has revealed Himself in His Word. They have no consideration for the fact that each form of revelation requires its own method of exposition. They take everything that the Scripture says about the structure of the universe, and cut it with one machine. A more mechanistic view of the Scriptures can scarcely be conceived. We do not deal so

even with human words. Your poet *Longfellow* sings as follows in his: "The Light of Stars":

The night is come, but not too soon;
And sinking silently,
All silently, the little moon
Drops down behind the sky.

There is no light in earth or heaven,
But the cold light of stars;
And the first watch of night is given
To the red planet Mars.

Is it the tender star of love?
The star of love and dreams?
Oh, no! from that blue tent above
A hero's armour gleams.

And earnest thoughts within me rise,
When I behold afar,
Suspended in the evening skies,
The shield of that red star.

Now who is there who will read this poem in the same way in which a ship's log is read? Who will conclude from this what the astronomic conception of the universe

of *Longfellow* or of the Americans of his day was? Who will dare sincerely to assert that to Longfellow the moon was small, and that it drops like rain; or that he thought that the stars were cold, and the planet Mars is colored red; or that a blue tent was spread above him, upon which the armor of a hero glistened, and that a shield was hung in the night-sky? And yet, such an exegesis is applied to the poetical books of Scripture by the defenders of a biblical world-image. If the Americans of that time had such a conception of the universe, would not your country which is now called the land of unlimited possibilities, deserve the name of limited impossibilities? Naturally, they cannot do this consistently, because the figurative language of the Scripture about heaven and earth has too great a variety. For instance, when they come to the statement of Job (26:7): "He hangeth the earth upon nothing," they let the literal in-

terpretation go immediately, because otherwise their hypothesis about the pillars and the primeval sea would be done away. Neither do they use their literal exegesis when it comes to those poetic sections which say nothing about heaven and earth, because then they would have to ascribe hands and feet, eyes and ears, to God. If they confine themselves to the historical books, to which the literal method must be applied, they cannot even find enough fragments for a construction of a biblical world-image. Their dome of heaven crashes down, for the firmament in Genesis 1 only brings separation. We cannot think here of a permanent partition, for God also made separation between light and darkness, between sea and land. Their one refuge is the Septuagint and the Vulgate, in which the word firmament is translated by *stereoma* and *firmamentum*. But these translations were made under the influence of the hellenistic world-

image. The Hebrew *raquia'* does not contain this meaning of firmness.

But there is more that needs to be said. They do believe that the Babylonian conception of the universe influenced the writers of the Bible, but they cannot prove it. To begin with, there is no such thing as a Babylonian conception of the universe. There are only Babylonian conceptions. Yes, but,—so they excuse themselves—these Bible writers did not use a definite Babylonian world-image, but a cross-section of several. If that be true, then we must conclude that these writers had reached a higher degree of astronomical development than the astronomers of Babylon, so that they were able to view all the world-images and to accept only that which was common to all. But so they jump from the frying pan into the fire, for in spite of themselves, they would be ascribing twentieth century knowledge to these writers.

Next, they overlook the unique in the leading of the people of Israel. Israel was certainly not a people without culture, nor was it poor in cultural wealth. It made the culture of other people its servant. But it never became a people of science. Wisdom, the *chokma,* stood on a holy elevation. The study of astronomy, however, was forbidden by divine command. Astronomers, soothsayers and magicians are named in the same breath in Scripture. In the wilderness they were told already that they may not regard the soothsayers (Lev. 19:31). At the entrance to Canaan they were warned again: "For these nations, which thou shalt possess, hearkened unto observers of times, and unto diviners; but as for thee, the Lord thy God hath not suffered thee so to do" (Deut. 18:14). When Isaiah predicts the doom of Babylon he mocks them with a humorous and spiritual sarcasm: "Thou art wearied in the multitude of thy counsels.

Let now the astrologers, the stargazers, the monthly prognosticators, stand up and save thee from these things that shall come upon thee" (Isaiah 47:13). Nowhere was there a pure astronomy. It was always inter-related to astrology and astrolatry. That is why God would have none of it in Israel. So that the idea that the writers of the Bible had a conception of the universe which they had borrowed from the Babylonians or some one else, and that they posited that in the Holy Scriptures, must be judged as being absolutely impossible. *Schiaparelli* is forced to admit that among the Hebrews astronomy stayed at about the same stage which, as we know, some of the barbarian peoples in America and Polynesia had reached, and in some cases, surpassed.

Besides, a world-image always has a scientific character. It may be popularized to a great degree, but the scientific foundation always remains. Do people use that scien-

tific basis in their everyday life? Not at all. If a botanist, or a zoologist attend a banquet, they forget all their learning concerning carbo-hydrates, starch, teeth formulas and histology, and using the same words as other guests they praise the fine taste of the food. Even if the writers of the Bible did cling to a Babylonian conception of the universe—a conception to which we are strenuously opposed—it would not be necessary for them to express themselves in scientific language in the Scriptures. If they had tried it, the Spirit would have stopped them. And it is noteworthy, that the existence of a Babylonian-Biblical world-image is also argued from the prophecy of a very ordinary man who had not one drop of scientific blood in him, Amos, a shepherd. Finally, honesty compels *Schiaparelli* to admit, too, that the analogies between the so-called Biblical and Babylonian world-image are surpassed both in number and weight by the

contrasts which exist between them. Of the five or six star-images which are found in the Scripture, he says that not one has been found among the many star-images of which the cuneiform make mention.

Very well—some will probably answer me—but this one thing is just as clear as day, that the Scripture views the universe geocentrically. And someone will remind me of the command of Joshua: "Sun, stand thou still upon Gibeon; and thou, moon, in the valley of Ajalon," and the statement which follows immediately: "And the sun stood still, and the moon stayed." If this is the last bulwark to which the defenders of an ancient and mistaken world-image in the Bible withdraw themselves, it will not take long to destroy it. For this can be explained sufficiently by referring to the every day use of words in which the sun is spoken of as rising and setting, words which the astronomer uses just as well as the man of the

street. There are still many more explanations, but to me it seems more likely that the word *sun* as used here is to be understood as *sun-shine*. A physician prescribes for a patient that he must sit in the sun a few hours a day, which, of course, does not mean that the physician desires his patient to fly to the sun, but it does mean, of course, that he wants the sick person to make use of the healing rays of the sun. This same use appears in Scripture. When it says that noon-day is the time when the sun becomes hot (I Sam. 11:9), it does not mean the sun itself, but its *shining* which increases in warmth. Joshua does not say a thing about the movement of sun or moon. He was the means, the instrument to work the miracle by which the sunshine kept on lighting Gibeon until the enemies were defeated; in other words, the light of day was lengthened.

The supposition that the Scripture pre-

sents an ancient and incorrect conception of the universe becomes extremely critical because of this, namely, that it not only makes the human authors unconscious liars, but that it makes God a conscious liar. Indeed, the command: thou shalt not make unto thee any graven image nor any likeness of anything which is in the heaven above, nor in the earth beneath, nor in the waters under the earth, is said to have traces of this ancient world-image. It is even exalted to be a locus classicus. But this commandment did not come to us through any human consciousness. It belongs to the law which God Himself engraved upon two tables. Angels delivered it into the hands of the mediator, Moses. But then God must have deceived His people. We can expect that this explanation will be offered: God accommodated Himself to the errors of that day so as to be understood. Some time ago this same thing was said about Christ. But

men have turned back from that position, and have been honest enough to say that according to their idea Jesus was Himself afflicted with error. Shall they go so far now as to claim this about the holy Law-Giver? It really amounts to about the same thing. A God Who is not able to make His revelation understandable without accommodating Himself to error, is a powerless God. He is an un-truthful God. But He is not our God. The heart of the Calvinist, for whom the glory of His God is held above everything else, rises in determined opposition to this.

So our conclusion can be none other than this: the ancient conception of the universe is not found in the Scripture. In fact, there is no conception of the universe presented in the Scripture at all, since a world-image is product of science, and the Scripture is not. How then must those expressions which seem so like statements of a world-image

be explained? In this way, that the Scripture writes about things as they are seen by the ordinary man or the poet or the prophet. Whoever climbs a mountain sees the world as a round plain spread out all about him, and heaven and earth seem to meet at the horizon. If he stands on the point of an island, he feels as if he has come to the end of the earth, even though he knows that the earth is round. The vision of the poet is a bit different. He sees the mountains skipping like rams and the hills as lambs. He sees the sea fly away, and the Jordan turning back. The vision of the prophet or the apocalypticus is still different. He sees Christ riding through the centuries on a white horse. He sees a temple in which cherubs fly with wheels. He sees an altar in heaven, under which are the souls of the martyrs. The man of science, however, no matter how exact an observer he may be, finds his strength not in seeing, but in think-

ing. The astronomer thinks of the world in relations; he thinks of movements and laws. That is why the Scripture, with its language of seeing, can be understood by everyone, while science cannot. In ancient times astronomy never got very far away from seeing. In more recent times thought became bolder and bolder, very likely because of research which was being made, and sometimes it became audacious. The conflict between the ancient and the modern conception of the universe rises up out of that fact rather than the difference between the geocentric and the heliocentric views. For the heliocentric standpoint has long since been let go. An adherent of the Copernican view would pass today as a lone survivor of an extinct race. The sun is still accepted as center of our *solar system,* but not as center of the *universe.* Where the real center is, or whether there is a center, they do not know. The ancient world-image seems to

be closer to the Scriptures because it stands closer to *seeing* or *sight*. But this is just appearance. At any rate, we can never be thankful enough to God that He has not given us a conception of the universe in His revelation. Science would have profited by it, but the Church, the gathering of all believers in Christ, made up for the most part of non-intellectuals, would not. But conceptions about the universe as they are found in the Scripture have at all times satisfied people, also the nature-peoples, as Schiaparelli remarks.

May we conclude from this that Christian people need not show any interest in the matter of having a world-image? Decidedly not! *Greszmann* may be right when he says that the ancients did not need a total world-image, but he is no less right when he adds immediately that the modern man faces things a bit differently. This is especially true about the scientific man of today. At

the same time, the modern conception of the universe cannot satisfy the need. We stand and wonder at the researches of *Herschel, Fraunhofer, Kirchhof, Bunsen, Schonfeld, Lorenz, Kaptijn, Easton, Shepley, Einstein, Planck* and other heroes of the telescope and spectroscope. But no matter how cleverly they measured the distances in space, how far they looked into the heart of the heavenly bodies, they have made contributions only for a very one-sided world-image. They looked only at the physical, and they neglected the metaphysical. Their world is only quantitative; they shut out the qualitative. They sign with their deed, if not with their own signature, *Lalande's* confession of faith: "I have searched through the whole universe, and nowhere have I found God." Even in that quantitative they have dealt only with fragments. *Nyland* admits that we shall get only a very faint image of the structure of the visible universe, an image

which will necessarily remain schematic for a long time to come. The wisdom of *Lessing* is his only comfort: seeking is more beautiful and desirable than finding. He guesses that there are one hundred thousand visible stars. *Eddington* says three thousand million. The dark stars are not included in these numbers, nor the spiral nebula on the other side of the Milky Way. *Eddington* says that the probability grows that the spiral nebula are island-universes, outside of our stellar-system, but similar to it. The numbers of light-years even though they be talked of as light-centuries, are like a fable. We cannot imagine such figures and on that basis already must the hope of getting a quantitative world-image be put aside. Modern man is something like an ant which belongs to a colony of ants standing at the base of a tree perceiving less than a thousandth of that tree. Added to that, we cannot discover any unity of motion in the universe

any more. Every star, so they say, has its own *motus proprius,* its individual motion. Their orbits can no longer be drawn as circles and ellipses, but imagined ovals must be called to help. *Kaptyn* viewed the motion of the stars as two swarms of flies flying through each other, with each mocking each and every regularity.

The modern world-image is most problematical. Is there ether, and if so, is it present in the entire universe? Are there other planets which are inhabited? Do new worlds still come into being? What is the origin of our earth and what its destiny? Is the universe finite or infinite? These are but a few of the many questions which are being asked, and about which heated disputations are made. Meanwhile the fool waits for a final answer. And so the modern conception of the universe becomes subjectivistic. According to *Poincare* the proposition that the earth revolves comes down to this: it is

easiest for us to imagine that the earth revolves. And what *Planck* said about the modern physical conception of the universe can be applied just as well to the modern astronomic conception of the universe: it is a creation of the human spirit.

The state of the question can be put thus: the need for a world-image is greater today than ever before. Neither the ancient nor the modern world-image can supply the need. Immediately the question arises: Can Calvinism? According to my conviction, most certainly! Calvinism has its own world-view; out of this it can come to its own conception of the universe. The first conditions for this are, that the world-view and the world-image shall not be separated from each other; that the world-image shall not only be understood to be quantitative, but especially qualitative; that the material and energistic shall not be all, but that the spiritual shall have the place of honor. The char-

acteristic quality of the Calvinistic world-image must never be found in its details, but in its harmony. It does not find a conception of the universe in the Scripture any more than it finds dogma there, but it does get principles from the Bible. It makes eager use of the well established results of astronomy, but considers them to be insufficient for the construction of a world-image. It takes to heart the teaching of the book of Job that the works of God in nature can never be investigated thoroughly, so that all detailed research, even though it is very necessary, always remains incomplete; it can construct a torso, but never a statue. It will have its problems here just as well as the unbelieving philosophy of nature, but it lives in the happy anticipation that here, too, the fragmentary will pass away when that which is perfect is come. It clings whole-heartedly to the record of creation, and on the basis of that it believes that al-

though the universe cannot be measured by human measurement, it is finite none the less. It rejects theories about the origin and the end of the universe such as suggested by *Kant, Laplace, Lockyer, Moulten, Chamberlain* and *Arrhenius*. It permits men to speak of millions of light years and light centuries only as a help for human calculations even as it makes use of the infinitesimal in mathematics, but it denies that there is any reality-value in them. It views man as the highest creature and even though life be found on other planets, Calvinism cannot nourish the thought that there are human-like beings or super-human beings there. It teaches that sin has had its effect also upon the world of stars and that an unbroken regularity shall never be found there. It is not modern natural science that has disclosed the smallness of man and the planet upon which he lives, as so many believe. Calvinism has uttered that as an all

but annihilating judgment. It took up the song of Israel's poet: "When I consider thy heavens, the work of thy fingers; the moon and the stars, which thou hast ordained; what is man that thou art mindful of him, and the son of man, that thou visitest him?" (Ps. 8:3, 4).

How much I would like to go on to mention some more of the features of the Calvinistic conception of the universe, and especially to work out the meaning of them a bit more extensively. Time does not permit this. But there is still one thing I must say, and this ought to dominate in the Calvinistic world-image. It has been said more than once that from the Christian point of view, the earth is not the astronomic center of the universe, but is the spiritual center. Consistent Calvinism cannot agree to this. Even though God has placed man over the works of His hands, and made the earth in agreement with this, there is another place

that is infinitely more important than the earth. It is heaven. That is God's throne, while the earth is only the foot-stool for His feet. From thence Christ exercises authority over the nations. From thence He rules His church. Calvinism with its theocentric thought-world must defend an oeranocentric conception of the universe over against the geocentric or heliocentric conception. Whether there is a quantitative astronomic center must be left undecided. But if it exists, I would not think this hypothesis to be too bold, that heaven is also the astronomic center. And why should not Calvinism have just as much right to set up an hypothesis as the unbelieving philosophy of nature? But however this may be, heaven is not a place outside of the universe, but within it. You give expression to the full recognition of that spiritual center in the universe as often as you pray with your whole heart: "Our Father which art in heaven."

Calvinism and Geology

Chapter V

CALVINISM AND GEOLOGY

No branch of the modern philosophy of nature seems to be so immovably fixed as its geology. *Price* is correct when in his "The New Geology" he says: "In geology we have long labored under the handicap of having several wide-sweeping assumptions lying at the very threshhold of our investigations and these assumptions have shown a phenomenal tenacity of life, because they were of such a nature that they could not readily be checked up by either experience or experiment." This is true especially of the definite order of plant and animal groups that have been discovered in the earth's strata. "This is," and I am quoting *Price* again, "treated as the most finely established dogma of the whole science. And few modern students of geology have ever

given sufficient attention either to the history of this idea or to its logical foundation to realize that their historical outline of the alleged successive forms of life is still only an assumption, and has already become an incredible assumption, in view of certain facts which have come to light in recent years." I am not ignorant of the fact that the authority of *Price* is severely questioned. But even though one differs from him, these statements contain more than a kernel of truth. Modern geology thinks itself to be just as immovable as the earth itself. Faith in creation is disregarded more insistently, and attacked from behind thicker ramparts by geology than by any other branch of the philosophy of nature. And even though it may not, according to the full meaning of the word, be called geology; even though it does not deal with the entire earth, but only with a small part of it, the earth-crust, the *litho-sphere,* the thickness

of which is only one-two-hundredth of the diameter of the earth, the *bio-sphere,* which includes all living things thereon, the ocean-filling *hydro-sphere,* and the earth encircling *atmosphere;* even though it is entirely ignorant of the *magma-zone* and the *bary-sphere* which is found underneath, yet it is bold enough to subject the revelation of Him Who created the earth to a criticism which hurls about huge blocks of granite, seeking to crush everything that stands in the way.

Perhaps you have a longing for the time when faith in creation was undisputed master. But you may not desire its return. For, from the point of view of the philosophy of nature, those days were usually days of ignorance. It is impossible for us to subject ourselves to the requirement made in earlier days, namely that it was not permitted to dig into the bosom of the earth, because only the earth's surface is given to the children of men. No matter what pleasant memories

you may have of your childhood, it is cause for joy that having become a man, you have put away childish things. That is true also of the history of science.

In the beginning of geology there was no thought of a conflict with the story of creation. *Steno* is the real founder of it. He made careful study of the earth's surface of Toscana, made distinctions between strata of earth in which there were no fossils of plants and animals, and those in which these fossils were found, asserting that there were six periods in which the sea flooded the land periodically, and returned again to its boundaries. He believed in an original horizontal position of the earth's strata, which were disturbed by thrusts from beneath, or by overweight of great bodies of water. A century later *Werner* became the great systematician in this field. The fundamental principles of this science were laid down by him. There is, for instance, the idea of

"formation," which, according to him, consists of a definite succession of earth's strata which originated immediately one after the other. And there is the idea of "period" in the history of the earth, controlled by the special boundaries of a formation. Also the idea of the "guide-fossil," a petrifaction which characterizes the separate formations. During this time mining operations and investigations in holes of the earth led to discoveries which made an old world live again. The first skeleton of mammoth was discovered in 1725, followed by fossils of birds, and mollusca. In this way everything was prepared for the arrival of *Cuvier* the third geologic magnate. The fact that I make no mention here of scholars of lower rank does not mean that I do not appreciate the value of their work. A purely practical reason explains my silence. When *Cuvier* began his work the madness of the French Revolution against science was well-nigh spent. The

Academy rose up out of her ashes. No one less than Napoleon permitted himself to be enrolled as a member, and he carried on a close relationship with *Cuvier*. There awakened a lively interest in the exact sciences, and *Cuvier* added enthusiasm by his enlightened ideas. He was the first to apply comparative anatomy to the fossils. He put down the basic idea of "Type" to which the variety in the animal world can be reduced. It was discovered later on that the number of types which he differentiated were too few to explain the almost countless variations in the animal world, but it was only necessary to continue building upon the foundation laid by him. It appeared to him to be impossible to classify the vertebrate fossils in the same order and groups as the living vertebrate. That is why he propounded his catastrophy and cateclysm theory, the doctrine of tremendous earth-revolutions, of the extent of which we can form absolutely

no conception. Each revolution called into being a new geological period. Because of this the animal world of the former period was destroyed and petrified. He admitted the possibility that some of the animals knew enough to hide their bodies and to pass over into the new period. Whether these populated the new earth, or whether Cuvier supposed a new creation each time, cannot be said definitely. This is certain, that his followers were committed to the hypothesis of many creations. It was under the influence of *Cuvier* that *Byron* in his "Cain" says that the world had been destroyed several times since the creation of man. The idea of unity in nature was preserved by the idea that throughout the revolutions of the earth the original types or general building-plans were maintained. He believed that species were constant. He defended this view-point in a debate with St. Hilaire at the Academy of Paris, and ac-

cording to the judgment of all, he returned to his home as victor.

By and large, these theories harmonized with the faith in creation. Looking at the systems of *Werner* and *Cuvier* one can ask whether they agreed at every point with the principles which are gotten from the Word of God; but they certainly were not anti-Biblical. On the contrary, they strongly supported the popular conviction that the deluge had brought enormous changes in the earth's surface. There was no danger of a conflict between faith in the Scriptures and the philosophy of nature. Not so with *Lyell*. He started out with the hypothesis that the past must be judged by the present. His actuality-theory did not admit of a revolution in the earth, but a revolution in our knowledge of the earth. And the leading geologists of today still adhere to that point of view. In his "Principles of Geology" *Lyell* says that exactly the same forces, the

same action of water, ice, etc., are sufficient to explain the successive periods of the history of the earth. The same slow tempo in which the earth's crust changes today, has always existed.

It is only necessary to accept periods of unusually long duration, in which the successive changes were accomplished. It is possible that this theory would have been short-lived had it not received support from the doctrine of evolution. *Lamarck's* philosophical zoology appeared at about the same time, and in this the idea of a gradual transformation in the animal world was propagated. A half-century later *Darwin's* "Origin of Species" made a still deeper impression. The biologists made good use of the millions of years with which *Lyell* helped them. Geology was scarcely ever studied independently, but nearly always in connection with paleontology, for they saw no chance to determine the earth's strata

without a study of the fossils. Today they are more closely united than ever, because of their common interests. Geology has come under the dictatorship of the evolutionary hypothesis.

How severely this dictatorship bore down upon geology appears from this, that it had to give up all its methods for arriving at the age of the earth-crust. *Lord Kelvin* ventured at first to guess one hundred million years, but allowed a margin up to four hundred million years. Paleontology did not like such a credit of millions, while the doctrine of evolution could not live on such modest fare. *Kelvin's* plan was cast aside. Attempts were made to arrive at correct figures by way of the speed of sedimentation and denudation. It was by this method that *Spencer* computed the length of time necessary for the formation of Niagara Falls to be thirty-two thousand years. There must be added to this the period between the

withdrawing of the ice and the forming of the falls, which *Chamberlain* and *Salisbury* extended over about thirty thousand years. This brings us up to the sixth glacial period in North America. If we add to this the earlier glacial periods we get a period of time varying between three hundred thousand and more than a million years as being the length of the deluvian period. *Wallcott* added to this the periods before the deluge and gave to the earth's crust the age of thirty to seventy million years. On the other hand, *Barell* thinks that the process of sedimentation and denudation is not so fast, and says that *Wallcott's* figures must be multiplied by fifteen. The maximum then would be a billion years. According to the calculations of life given by paleontology this is almost too short. In these later times the helium and the radium-lead methods have come into use. These methods rest upon the discovery that the decomposition of uran-

ium results in radium with the release of helium atoms, and that the radium atom further decomposed into lead with further splitting of helium.

The first method declares that the earth can be about six hundred million, while the latter affirms it can be sixteen hundred million years old. Although these methods are not purely geological, but physico-chemical, they make their appeal especially because the slovenly sixteen hundred million years are more acceptable to the exacting paleontology. We need not pause to indicate in detail that there are guesses here, some of which have proved to be mistakes. The uncertain factors with which geology must work in its computations, are legion. Nowhere has a complete series of sediment been found. The helium method turns two geologic periods around. *Rutherford* and *Joly* are of the opinion that the decline of the radium-atom took place more rapidly

in former times than now. And the comfort is this, that although the geologist does not know with how many millions he can speculate on the stock market of the philosophy of nature, he can, at any rate, let millions slide through his fingers. They think themselves to be multi-milliardaires, who do not even know how wealthy they are. But I am convinced that if they were called upon to pay taxes on these millions, their computations would be a bit more cautious.

Let me quote some figures out of the budget of paleontology for you. Although I have consulted the latest statistics, we cannot say definitely that these figures are correct. In 1928 *Koppel* counted as many as thirty-six theories about the ice-age. But notice now the figures given for man, according to the reckoning of *Soergel.* For the *homo sapiens,* to which you and I have the honor of belonging, six thousand years. For his predecessor, the *Cromagnon man,* fourteen thou-

sand years. For the *Neanderthal man,* who preceded him, three hundred and twenty thousand years. For the oldest known man, the *Heidelberger,* four hundred and forty thousand years. Overlooking two factors, namely, that it is possible that older human types have lived, of which no traces have as yet been discovered, and that the types that have been mentioned were colonists from Asia, and these figures have reference only to Europe, then paleontology must be satisfied with the very modest figures of seven hundred and eighty-four thousand years for man only. Some are ready to drop a few thousand years from this number, but the lowest bidder still stays at about two hundred and fifty thousand years. When you remember that man arrived rather late upon the fossil-stage, that he first shows his skull and bones in the last and smallest part of the newer history of organic life on earth, the Kainozoic; that the middle ages, the

Mesozoic, preceded with its lowly organized mammals and birds; and that there was also an ancient time, the Paleozoic, with its sea-weeds, its cryptogam ferns, its snails, crabs and other creatures living their monotonous lives; and that beyond these there were still two periods of long duration, the Algonkian or Ezoik and the Archaic, in which the organic had not yet been developed, it must surprise you that the scrupulous paleontologists, who propose to give their fantastic colleagues a lecture, assert that they can get along with a meagre two hundred and fifty million years. At that rate they must conduct their biological household very simply. Even the highest credit of the geologists, one hundred and sixty million years, arrived at by the radium-lead method, is still too little. That is really a starvation wage.

What account did the believers in the Scripture give of themselves in this matter?

To be sure, it must be stated at the outset that the Bible does not reveal a complete chronology. It does contain data which are valuable in arriving at a chronology of the earth, but an exact chronology is not given. The Rabbis thought differently. By using some texts, and overlooking others, they defined the age of the earth with great accuracy. For the Jews this is the year 5690 after the creation of the world. Many Christians adopted that chronology without thinking. But today we have arrived at the view that Scripture is silent concerning the absolute age of the earth, and even concerning the absolute age of man. The indications of Scripture are so clear, however, that the Christian who reveres it, cannot and may not take part in the paleontological and geological hunt after millions. The Scripture excludes the possibility of the human race being two hundred thousand years old. And that organic life came into being mil-

lions of years ago must be judged a myth. *It is not true that the data of the natural sciences demand such high numbers; the evolutionistic principle demands this.* It is the antithesis against faith in creation that drives to these excesses. This movement is called into being by the desire to depose the Creator of the universe and the Former of the earth willingly or unwillingly. Should not all Christians from all lands unite to oppose this? Should they not as one man stand firm against the advances of the modern philosophy of nature? Should not the command be given all along the line: Principiis obsta?

They should have, certainly! But it did not happen. A large body of Christian scholars hoisted the white flag. They were afraid lest they be called unscientific when they did not yield to the demands of geology and paleontology: Give us room for our evolutionistic ideas. And so they began to

apply the thumb-screw method to the Scripture. The Scripture must furnish the millions which they wished to pay to the unbelieving science in order to keep their good name. Of course, they did not call it a thumb-screw method. No, it was called an attempt at *reconciliation*. But they were not different from the attempts of those who wanted to make Christ and Belial agree. It cannot be regretted enough that Christian science in many periods of its history has behaved itself so half-heartedly, and acted so cowardly.

But those went furthest who construed a separate kind of exegesis for the story of creation in order to please unbelief. This exegesis was not to be allegorical, poetical, or mythological, but what it really is, they did not say. It amounts to this, that the hexaemeron of Genesis I does not necessarily have to be taken up literally. Rather, one must see in it the narration of six log-

ically differentiated moments in the creative work of God, six divine ideas becoming real through the formatio. It would not be possible, according to them, to determine anything from Genesis concerning the length of time used in the preparation of the earth. If science needs millions of years, Genesis does not object. This conception is honored these days especially in Roman Catholic circles. It is hardly believable how deeply evolutionism has eaten its way into Roman Catholic science. They think they have *Augustine* as their support. Through a wrong interpretation of a text in one of the Apocryphal books this church father taught that all things received being and form from God all in one moment. He said that the constantly repeated words: "and the evening and the morning" had reference to the cognitio vespertina of the angels. Even though this presentation is subject to just criticism, you feel that it has nothing in

common with the Roman Catholic evolutionists, in fact, it is exactly contrary to it. *Augustine* said that everything came into being in one moment, while the Roman Catholic philosophers of nature say that it happened in a process of many, many years. The tendency to make exegesis serviceable to the decrees of unbelief is very evident here. In appearance the authority of the Scripture is saved, in reality it is undermined.

But they who do not create a special exegesis for the first chapter of Genesis, face three possibilities. The geological changes have taken place *before,* or *during,* or *after* the hexaemeron.

There have been those who were attracted most by the first possibility. The thought had been suggested long ago that the *tohoe wabohoe* of which Genesis 1:2 speaks, refers to a devastation which, through some cause or another, came upon the earth. But

the loud clamor of geology caused many to ask the question whether this verse could not possibly contain the revelation concerning those supposed former revolutions. We must admit that theology has not taken this text sufficiently into account. I believe that a Calvinistic philosophy of nature can derive more than just one principle from this verse. No exegesis can determine how long the chaotic condition lasted, so that already on that basis theology is prevented from ever reckoning correctly the age of the earth. If you could suppose for a moment that the radium-lead hypothesis was not as untrustworthy as it is, and that it was not inspired by the evolution myth, then we could say that the Scripture as such does not oppose that theory, although it does not support it either. Taken by itself, it is not impossible that the breaking off of uranium had already begun then, but we would not dare to go any farther. To suppose, for in-

stance, that there was a cosmos before the tohoe wabohoe, a cosmos upon which the Heidelberg, the Neanderthal and the Cro-magnon men lived, is not permitted. For the Scripture, and thus for us, the human whom we now know is *the* human. Even the evolution theory would not profit by this. Genesis 1:2 speaks of a complete chaos. No organic life, no matter how infinitesimal, was found there. But admitting that, then the root-idea of the evolutionary hypothesis must be given up, for that consists of an uninterrupted development from the inorganic to the organic, and from the lower organic to the higher. And it would demand the same millions of years after the supposed revolution in the earth's surface. So that this theory can be accepted by the evolutionist no better than by the consistent believer in the Scriptures. For according to it, the hexaemeron would be the record not of a creation, but of a re-creation, not

of a formation, but of a reformation. That is contrary to the continued witness of the Scripture. Since this theory could not be used by anyone, it need not surprise us that it found but a few adherents.

The state of affairs is different when we come to the second possibility, which was gladly laid hold on by nearly all Christian apologetics. The geological periods could be shifted so easily to the hexaemeron provided one would be willing to conceive of the "days" as "periods." Then the theologians and the geologists and the paleontologists could embrace one another and cry: we have found each other. There did not seem to be any exegetical difficulties. Could not evidence be found in the Scripture that the word "day" sometimes meant periods of longer duration, although it may not be a period of exactly a million years? And does not Peter write: "But forget not this one thing, beloved, that one day is with the

Lord as a thousand years, and a thousand years as one day"? (2 Peter 3:8). But after this feast of brotherhood the disputes arose all too soon. The millions were counted out on the table, but the modern philosophy of nature was not satisfied with that. The apologetes had shouted: faith is confirmed by science, and the order of Genesis I is agreed to by geology and paleontology. But protests arose from the side of the philosophy of nature. They sent this message to Christian Apologetics: "You must change the sequence of Genesis I, for it is not right; if you fail to do this, our company will break up."

You can still make acquaintance with apologetes who have never read this note, and who still live in the sweet fancy of the eternal peace between faith and evolutionistic natural science. But the modern philosophers of nature are right. The order of creation is other than that of geology and

paleontology. For the organic world the order of the record of creation is as follows: first the vegetable kingdom, then fish and birds, the reptiles and mammals, and finally man. The geological and paleontological order is so much different that one cannot begin to record them in a lecture. Many plants come after the lowest developed animals; the lowest organized mammals exist before the birds; especially the order of reptiles and birds is just exactly opposite to that of the Scripture. It is asserted that fossil remains show that birds evolved from reptiles. For a long time men were of the opinion that the transition form between the two was the archaeopteryx, of which a nearly complete sample is on display in Berlin, while a headless brother adorns the British Museum. But today it is said that both of these primitive birds have very important differences. And the most recent hypothesis says: these primitive birds either have a

long period of development behind them, as birds, in which time the differences could have come, or else they have not come from one reptile-form, but from two different ones, in which all differences, also those of the skeleton were wrapped up. But they will not permit the dogma to be changed: first the reptiles, then the birds. I shall pass by the question of monophylogenesis and polyphylogenesis. Biologists and paleontologists are still divided among each other on this matter. At any rate, there is no agreement between the Biblical and the evolutionistic natural-philosophical order. The modern philosophy of nature does not know what surrender means. Shall the Christian apologetes accommodate themselves again? I fear so.

But we may expect better things from the Calvinistic philosophy of nature. It may not deviate from the revelation of Scripture. It must call Christianity to reflection

again. The entire periodistic theory which transforms the days of Genesis into geological periods must be opposed in the strength of faith. This theory will have nothing of the Scripture, the authority of which extends also over the natural sciences. It is absolutely unacceptable to the Calvinist who more than any other Christian keeps guard at the principle of the authority of the Word of God. And that not only for two or three reasons, but for ten or twenty or more reasons. Take, for instance, the forming of man. Can it be considered to be in agreement with the Scriptures to say that Adam, the first human, was identical to the Heidelberger of geology, who, were he to be met alive anywhere would be considered by everyone to be a degenerated type? Can it be said of this one that he was created in true knowledge, righteousness and holiness? Is not the idea that the so-called homo sapiens developed after thousands of

years in the so-called sixth period excluded, because the Scripture establishes the truth that the first child was born after the fall?

Besides this, there is the no less complicated *problem of death.* If geology and paleontology are right then whole worlds of organic life had already become fossils before man became a living soul. Is that in agreement with the doctrine of Scripture? We could make a distinction between *dying as a physical evil* which has come over all the organic world as a curse, the result of man's sin, and a *cessation of existence* because of spent life-powers which God has given to every creature. But the petrifactions teach that these beings did not cease to live merely because their vitality was exhausted. We must conclude from the posture of some of the fossils that these creatures struggled until the last against hostile forces. There are others which have been found with remains of food in their jaws,

which does not argue much for a falling off of strength. Besides, there is the fact that what we usually call death due to old age is never caused merely by the weaknesses of old age. Rather, we must see here the effects of injurious bacilli and bacteria, against which the old body can no longer offer resistance. And you will agree with me that in a state of affairs without sin such injurious causes cannot be supposed. Paul heard the whole creation groaning and travailing in pain because it was subject to vanity and transitoriness. He ascribes this vanity, this transitoriness to "the bondage of corruption" which has come over all of creation because of the sin of man. It shall first be done away when the children of God have received the liberty of glory (Romans 8:19-22). Transitoriness and sin are related so closely here that they cannot be loosed. No transitoriness without sin. It is interesting to refer at this point to the ex-

periments made by Professor *Hartman* of Berlin a few years ago. One hundred and thirty times he cut off a piece from an amoeba proteus, and after each operation it retained its vitality. From this he concluded the immortality of the protista, not only of the species, as *Weismann* had already said, but of the individual. But he felt that he ought to add that the circumstances at the time of the experiments were much more favorable than they would be in nature. Well, I shall go a step further and dare to assert that the circumstances in the morning of creation were ideal compared with the most favorable experiment. Whether it is correct to say that before the fall organic life used up its life-power, is a question. But we may never believe that any organic being could have suffered death by violence before the fall. And yet, the dumb fossils seem to be talking evidence of just that. That is why they cannot be placed as

petrifactions within the hexaemeron. Neither is it exegetically deserving of approbation to change the days of Genesis into millions of years. Those days had only one evening and one morning. Besides, God recorded it Himself: for in six days the Lord made heaven and earth, and He rested the seventh day. The creation-week is given to the church as an example for every week. Modernistic exegetes of the later time feel, too, that the writer of Genesis undoubtedly meant an ordinary day when he wrote of creation-days. And we who think of the writer as an instrument of the Auctor Primarius, the Holy Spirit, cannot conclude anything else, but that he recorded an infallible truth there. Time prevents me from answering many questions concerning the days of Genesis. I just want to state my own opinion that the length of those days was not determined by the sun, but by the rotation of the earth upon its axis.

All those theories which proceed to stretch out the Scripture upon the Procrustus-bed of the unbelieving philosophy of nature, need to be rejected. By doing this we do not deny the geologic changes. The Calvinistic philosophy of nature is not blind to the data of nature. It recognizes the difference in the earth's strata. It does not want to lose one bit of fossil material. But it supplies its own interpretation to all this, an interpretation which will often be hypothetical, but none the less just as legitimate as the hypotheses of unbelief. First of all, it breaks with the uniformitarian theory of *Lyell,* a theory which is made non-active by the unbelieving philosophy of nature whenever it pleases so to do. So that at this moment they suppose that the speed of sedimentation and denudation differs now from earlier times. And it is stated without a blush that the orogenesis, the formation of mountains, was much more intensive in ear-

lier periods than at the present time; and there is no hesitation in adding, as if they were not aware that they were being untrue to their own theory, that the formation of mountains is much more gradual than that of a volcano. *Bray* and *Soller* have showed us that we may not measure the speed of light in former times with the measurements of today. It decreases two hundred and fifty miles per century, and in case no modifying factors arise a standstill will have been reached in seventy-five thousand years. But these factors have already been reckoned with, so that one does not need to worry about his posterity in that time. Sediments of more than nine thousand feet were discovered in the northern part of Atjeh. It was thought that this presented an entirely new neogene. After a study of the fossils, however, it appeared that the highest strata showed exactly the same characteristic fauna remains as the

lowest strata. The entire series must have been built up in a comparatively short time, favored, perhaps, by a strong and sudden settling of the underground. So that while one still swears by the theory of *Lyell,* and even goes so far as to force it upon us with the penalty of losing our scientific position in case we refuse, still, in practice, it is often discarded.

A Calvinistic philosophy of nature will hesitate to judge the past by the present. It will remember that the times of the earth are also in God's hands. How will it then be able to explain the geological changes? Of a theologian one may not expect the completely developed theory, for the work of experts is required, as has already been said. But let me make a few suggestions. If I view things correctly, then the separation of light and darkness on the first day also includes a separation of what we now call the earth and the chaotic mass out of which

the heavenly bodies were formed the fourth day. What influence that had upon the earth's crust can never be investigated. Neither can the influence of the origin of the atmosphere on the second day and the hydrosphere on the third day be traced. Yet, the effect of this must have been tremendous. Above all, it may not be forgotten that, even as Adam and Eve were not created as children, but as mature persons, so the earth, at the end of the sixth day, was not in a primitive, but in a completed state. Then too, it is evident that as soon as the curse was pronounced upon the earth, that curse caused the earth to tremble at its heart as well as on the surface. I do not think it too daring a hypothesis to say that after the fall great crises broke out upon the earth, crises which we can safely call catastrophes, if we but distinguish them from those of *Cuvier,* catastrophes by which entire stretches of organic life, and later on perhaps also of de-

generated human types, were destroyed. It cannot be charged against this hypothesis that the Scripture says nothing about all this, for there is so much that the Scripture does not say, since it is not a source-book for geology or world history, and does not pretend to satisfy our curiosity. We may also believe that, thanks to the common grace of God, humanity was not struck at its center by this curse of sin. That happened first at the time of the deluge. To explain every geological change with the deluge, as is so often attempted, seems to me to be an effort which is destined to failure. But an equally serious warning must be sounded against any attempt to belittle the effects of that deluge. Studies made in these last years have shown what a great factor it was in the formation of the present appearance of the earth. We are safe in saying that the deluge was the last great catastrophe that has struck this earth. In

the light of that fact the promise of God has a new meaning: "While earth remaineth, seed-time and harvest, and cold and heat, winter and summer, and day and night, shall not cease" (Gen. 8:22). I repeat, there is much of the hypothetical here; but even a Calvinistic philosophy of nature will not succeed without hypotheses.

The immovable principles, of which I have already cited a few, are of an incalculably great value for geology and paleontology as branches of a Calvinistic philosophy of nature. I will add these few: the original chaotic condition of the earth, the formation of a cosmos by divine ordinance, the separate formation of plants, animals and man, so that these could not have originated the one from the other, the mature condition of the creation in the hexaemeron, in which great possibilities for development are given, but which certainly may not be characterized as primitive or low, the pene-

tration of the curse even to the non-human and the restraining thereof through the gratia communis. When Calvinism keeps these and similar principles intact, and applies them correctly, and at the same time accepts the geological and other data as they present themselves, it will be able to erect a grand system here even as in other sciences. Whether in this way it will save drowning humans from the waters of the evolutionistic philosophy of nature may be asked of God, but that is not the chief thing. The chief matter is that it shall cultivate the sciences to the glory of the Triune God. And while Christian scholars of our day hesitate to draw the conclusions from their faith for the natural sciences, let the Calvinism of today exert double effort to do just that. Whether or not we are in the minority quantitatively, does not matter. Qualitatively, because of our principle, we are in the majority.

And now I have reached the end of my task. I hope you will pardon me for leaving many important subjects bearing on the philosophy of nature untouched, as, for instance, the relation between natural law and the miracle, and especially the theories of evolution and descent. But I had to limit myself. I flatter myself, however, to have convinced you that Calvinism has a message for present day science, and that it has invaluable elements for the construction of a philosophy of nature. The inscription on the seal of the University at which I am permitted to labor, gives relief to a statement of Scripture which ought to enthuse us in our battle against unbelieving, and in our construction of a believing philosophy of nature: "Auxilium nostrum in nomine deo, qui fecit coelum et terram." "Our help is in the name of the Lord, who has made heaven and earth."

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